POPULAR MECHANICS

SHOP NOTES

FOR

1906

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MECHANIC.

Volume II—Table of Contents, Pages 418-424

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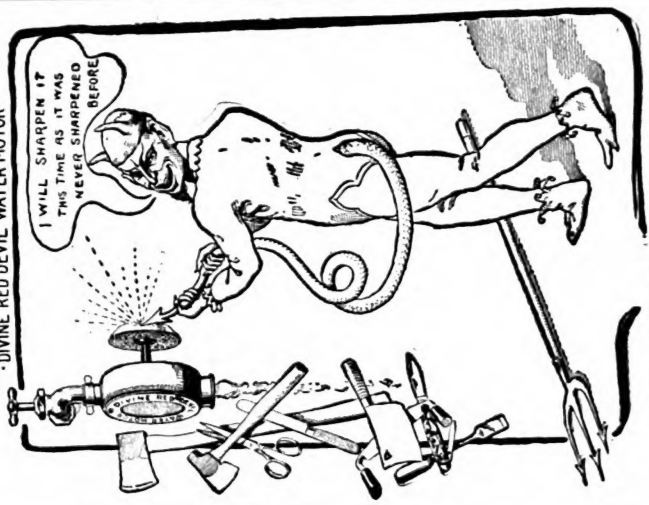
POPULAR MECHANICS, CHICAGO

A POINTED TALE

DIVINE RED DEVIL WATER MOTOR



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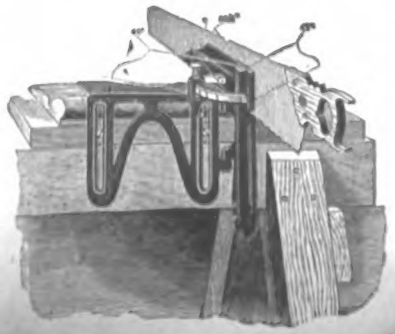

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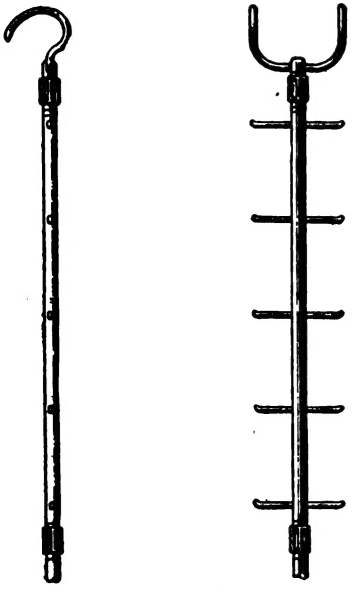
All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

HANDY EXTENSION LADDER

A very handy extension ladder can be made of 1-in. pipe and the teeth of an old horse rake, says a correspondent of Domestic Engineering. Take the teeth out of the rake, heat them in the forge to strengthen them, but do not burn, and cut them up into 20-in. lengths, or to the best advantage. In an 8 or 10-ft. length of 1-in. pipe punch holes about 12 in. apart and just



Pipe Extension Ladder

large enough to allow driving the pieces of steel through tight.

Make a double prong of the steel at the upper end, shaped to hook over a joist or other support. Weld the prong into a stub of 1-in. pipe that will screw into a coupling. Make as many sections of ladder as you are apt to need.

In England public bakeries are not allowed to conduct operations underground or in basements, on account of sanitary reasons. If the offense is not corrected after 14 days' notice the owner is arrested and the place closed.

ROPE SWAB FOR ENGINE ROOM

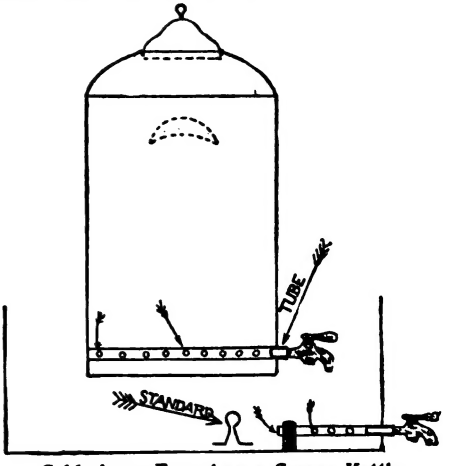
Cotton clothesline is the proper rope to use for a polishing swab, says a correspondent of the Engineers' Review. Have

Soft Rope Swab

about five strands of the rope and twist and wrap them as shown in the illustration. Tie the ends securely to prevent raveling.

TO SOLDER FAUCETS ON COPPER KETTLES

Do not use a boss or any kind of a brace in securing a faucet to a copper kettle, says a correspondent of the American Artisan. Instead, make a tube the size of the faucet; punch a number of holes in it; solder it to the faucet, run it through the kettle and solder it at the rear of the



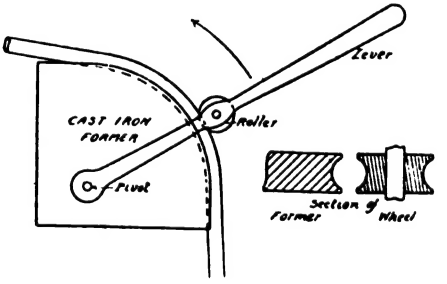
Soldering a Faucet on a Copper Kettle

kettle and, also, at the faucet. This is for round kettles.

Where a kettle is boiler-shaped, with a faucet at one end, make the tube about 8 in. long and for the inner end provide a standard, fastening the standard to the bottom of the kettle.

PIPE-BENDING DEVICE

The illustration shows a handy mandrel or former for bending iron piping while hot. A lever and roller is used to press it into shape. Copper piping may be bent while



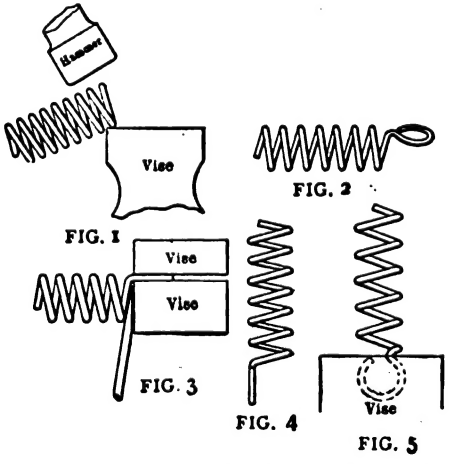
Pipe-Bending Appliance

cold in the same way, but should first be filled with molten lead to prevent buckling, says the Model Engineer. Remove the lead by heating the pipe.

BENDING A SPRING LOOP

It is easy to bend a loop on a coiled spring in the following way, says a correspondent of the American Machinist.

Hold the spring in the left hand so the first coil is over the edge of the vise-jaw, the end of the spring being upward as at Fig. 1. With a hammer strike a quick blow on top of the spring, so causing the first coil to open out nearly at right angles to



the spring (Fig. 2). Catch this first coil in a vise, as at Fig. 3 (top view): force a screw driver in, as shown, and get the coil set in line (Fig. 4). To set the ear central, clamp the ear upright in the vise (Fig. 5) and, using a hammer, punch as close to the top of the vise as possible.

CEMENTS FOR STEAM AND WATER JOINTS

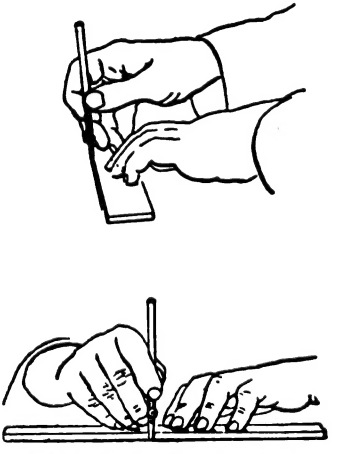
1. Black oxide of manganese mixed with sufficient raw linseed oil to bring it to a thick paste. Remove pressure from the pipe and keep sufficiently warm to absorb the oil while the cement is being applied to the joint or leak. This cement is recommended by a correspondent of Machinery, who says it will be as hard as the iron pipe in 24 hours.

2. With boiled linseed oil mix together to the consistency of putty the following ingredients: Ground litharge, 10 lb.; plaster of paris, 4 lb.; yellow ochre, ½ lb.; red lead, 2 lb.; hemp cut in ½-in. lengths, ½ oz.

3. Another good one consists of white lead, 10 parts; black oxide of manganese, 3 parts; litharge, 1 part. Mix with boiled linseed oil. Recommended by the Monumental News.

HOW TO HOLD THE RULING PEN

In ruling, hold the pen at right angles to the paper, not allowing the point to reach out or in from the straight edge, or it will

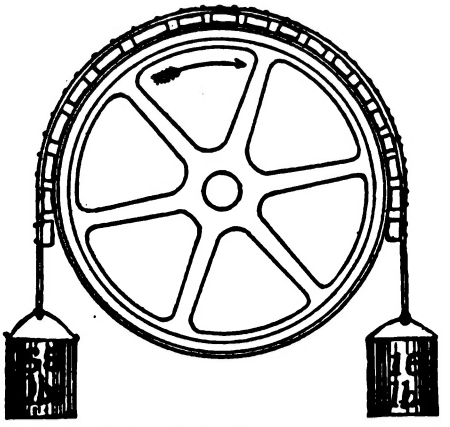


Hold the Ruling Pen Like This

make a ragged line. If it reaches in, the ink is apt to run under the straight edge and make a blur.

TO DETERMINE BRAKE HORSE-POWER

To determine the brake horsepower of an engine attach cleats of pine, basswood, or other soft wood, to a piece of a belt and hang it over the fly-wheel as shown in the illustration. Fill two paint buckets having handles with small pieces of iron or small stones and attach to the ends of the piece of belt. When the engine is running, weight the buckets until they balance and the engine is pulling a full load without decreasing its speed. Count the speed, says the American Miller, while it is running under this load, and when satisfied you have determined the number of revolutions it will



Test of Brake Horsepower

make under the load, stop the engine and weigh each bucket.

Find the difference in the weight of the buckets, which is the number of pounds pulled by the engine Multiply the circumference of the wheel in feet by the number of pounds pulled, by the number of revolutions per minute, and divide the product by 33,000. The result will be the brake horsepower.

With a flywheel 2½ ft. in diameter, capable of making 300 revolutions per minute while pulling 52 lb., one would proceed as follows:

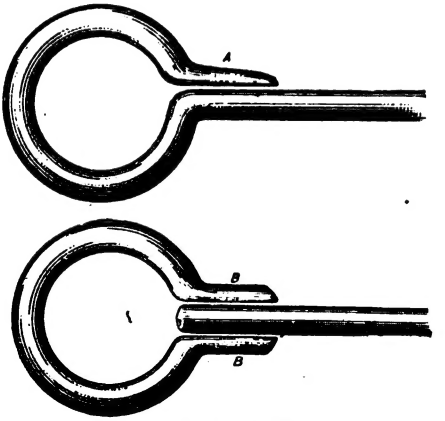
$2\frac{1}{2}$ ft. × 3.1416=7.85 ft., circumference.

$$\frac{\text{Cir.} \quad \text{Rev.} \quad \text{Lbs.}}{7.85 \text{ ft.} \times 300 \times 52} = 3.7 \text{ h. p.}$$
$$33{,}000$$

For straining paint uses millers' bolting cloth. For ordinary purposes 5-cent cheese cloth will do.

SEVERAL METHODS OF MAKING A SOLID EYE

In making a solid eye, to upset the ends of the rods and punch the eye is a poor method, says a correspondent of the Black-



Making a Solid Eye

smith and Wheelwright, as the upsetting tends to open the fibers of the iron. There are a number of ways of making a solid eye, the merits of each depending a good deal on what the eye is for and its size.

The rod may be partially upset and drawn down, or the eye may be made and welded on to the bar. In Fig. 1 the eye is made by bending the rod round to form the eye, first drawing the point and welding it at A. As shown in Fig. 2, a tongued joint is used, welded at B B.

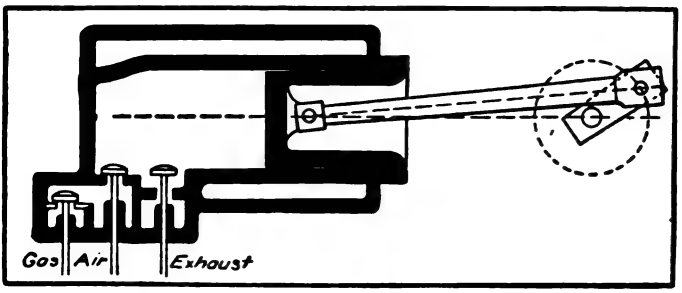
PREPARING TIN ROOFS FOR PAINT

When painting a new tin roof examine it first to see whether the tinner has used rosin or acid in soldering and left some of either on the roof. Rosin may be scraped off with a knife and acid must be cleaned off by rubbing the seams in the tin with kerosene oil and then washing with soapsuds and rinsing with clean water. For new tin that feels greasy, apply a wash made of 1 lb. of sal-soda in 6 qt. of water. Let stand one-half day, then wash tin with clear water. The paint will not scale off when this is done.—Grinnell's Handbook on Painting.

STARTING THE GAS ENGINE

In stopping a gas engine, after the gas is turned off the engine makes several revolutions, during which time it is drawing in air alone. This is what causes the trouble often experienced in starting up again, says the American Telephone Journal. The gas, when turned on, becomes diluted with the air already in the cylinder, as well as drawing air in with it.

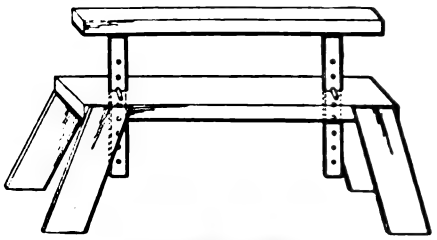
To save trouble, under these conditions, before starting up turn the flywheel until the exhaust valve is wide open and leave the valve in this position until the burned mixture has had time to escape. Moving the piston back and forth several times will facilitate matters, also. Then, with the exhaust open as in the diagram, start the engine, and there will be no difficulty in getting it to go.



Exhaust Open to Start

AN ADJUSTABLE HORSE FOR PAINT SHOPS

A pair of adjustable horses, like the one shown in the illustration, will be found convenient in many shops, says the American Artisan, but especially in car-painting shops. A plank should be laid across to form the staging. The construction is explained by the sketch.



Adjustable Horse

PORK RINDS FOR PACKING

I have been an oil pumper in the Indiana oil fields for a number of years, and have had considerable experience, as well as trouble, with different kinds of stuffing-box packing, old polish rods and worn-out stuffing-boxes. I find that the best and cheapest packing that can be used in water wells, a packing that will never get hard and bind in the box, nor wear the polish rod, is common pork rinds.

Cut them in strips about ½ in. wide, or use them just as they are cut from the meat. Pack by winding them around the polish rod till the box is full.

If the box is worn much in the bottom, it is well to put in a bit of hemp or prepared packing first, to prevent the rinds from working past the rod into the well. Just try it once.—Contributed by Bert P. Fleming, Petroleum, Ind.

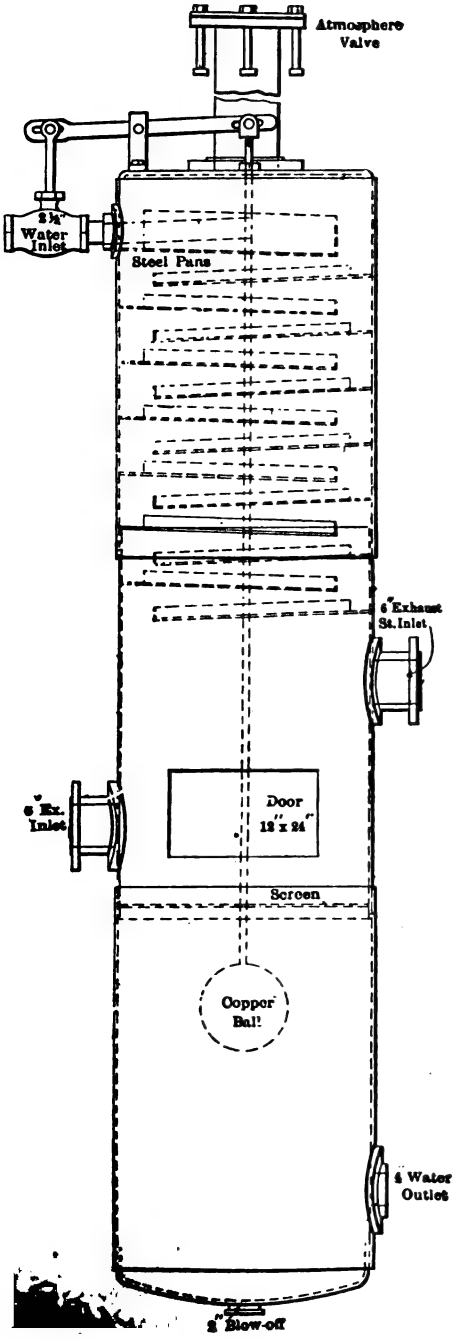
TO EXTERMINATE ANTS

Make a hole about 18 in. deep in the ant hill by pushing down into it a stick. Into the hole pour a wineglassful of carbon disulphide. The liquid is highly inflammable, more so than gasoline, and has a disagreeable odor, but it kills the ants.—Contributed by Henry K. Edgerton, Oconomowoc, Wis.

LABELING PASTE FOR TIN

Use flour and water to make a stiff paste and add 2 oz. of tartaric acid and 1 pt. molasses. Boil till stiff, then add 10 or 12 drops of carbolic acid.

A HOME-MADE FEED-WATER HEATER



Home-Made Feed-Water Heater

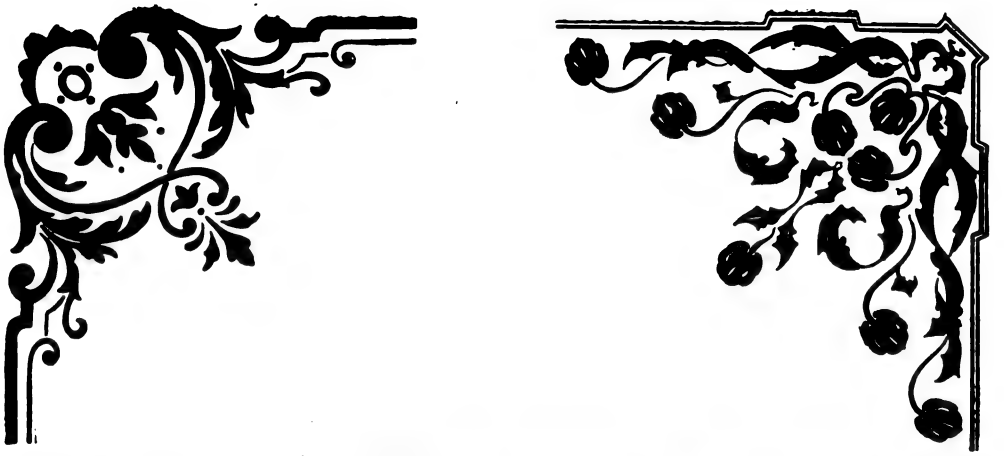
In boiler plants where the system of heating feed water is unsatisfactory, a home-made feed-water heater utilizing the heat from the exhaust steam may be substituted with a great increase of efficiency. A correspondent of Power tells how such a heater was made for a plant where feed water had formerly been heated in coils placed in the stack foundations. The chief steam consumer was a large compressor located just outside the boiler house and the exhaust from this compressor and the feed pump was sufficient to bring the feed water up to the desired temperature.

To make the heater a three-ring section of an old boiler, each sheet or ring being 4 ft. long was utilized. One end of this section had a dished sheet steel head and the other end was fitted in like manner. The heater was to stand upright so an 8-in. hole and an 8-in. tapped flange were put in the center of the top head as an exhaust vent or outlet. Into the flange was screwed a piece of 8-in. gas pipe, long enough to extend through the roof and a "clack" or atmospheric valve was placed on top of the pipe (see sketch).

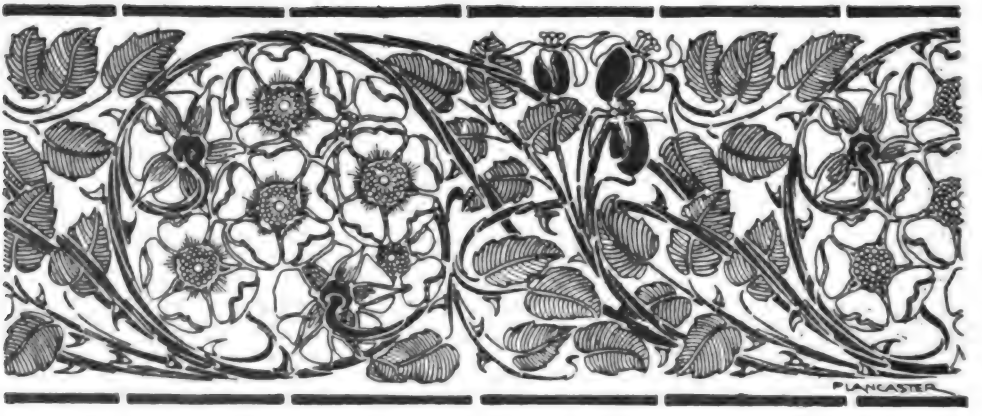
Into one side of the boiler section at the top was run a 2½-in. nipple plugged at one end. This carried the water into the heater, delivering it through 50 or more ¼-in. holes drilled in the lower half from which the water dropped upon a series of fourteen pans arranged consecutively, as shown.

The lowest of these pans was just above the middle of the heater, and the exhaust was run in at about the middle, and here, also, was placed a door 12 by 24 in. Just below the door was placed an old fine-mesh screen to prevent foreign substances from reaching the pump. The outlet to the pump was placed 10 in. above the bottom, and in the center of the bottom was put a 2-in. blow-off which is opened daily to get rid of any deposit. A copper-ball float, attached by a reach rod through a small brass bushed hole in the top operated a lever which controlled the regulating valve and kept the water level just below the screen. A double-ported regulating valve was used—being substituted for a 2½-in. gate valve formerly tried, but which did not give good service.

This heater is self-regulating, and reliable. It takes the mud out of the water, and the average temperature maintained is 204° Fahr. The total cost of the heater in place was just $155.



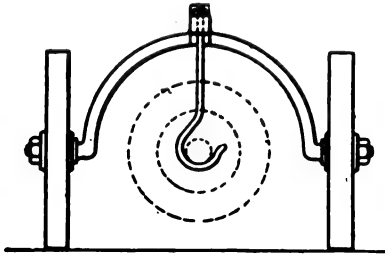
Corner and Frieze Designs from Decorators' Magazine, London

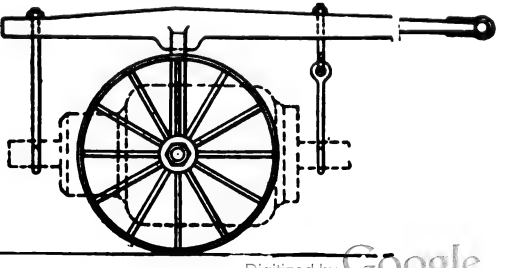


CONVENIENT ARMATURE CARRIAGE

This device which was built by the master mechanic of the Union Electric Co., Dubuque, Ia., is described in the Street Railway Review as follows:

An arched bar terminates in journals on which are mounted the wheels, the radius of the arch being great enough to let the buggy run over any of the armatures used. To the top of the arch is fastened rigidly a long bar which is the longitudinal member of the buggy. For supporting the armature, there are two rods depending from the straight bar, each having a hook at the lower end. One of these rods is rigidly fastened to the long bar, while the other is attached to an eyebolt and is free to swing.

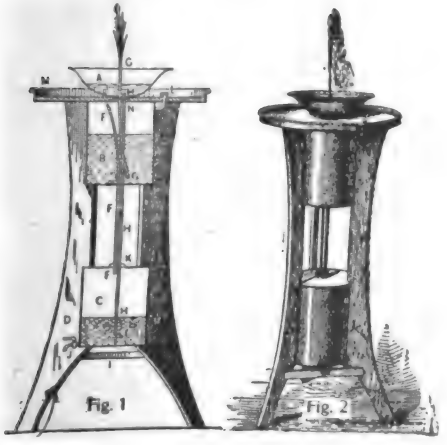




HOW TO MAKE A SHOW WINDOW FOUNTAIN

A fountain that will throw a stream 12 in. high for six hours and which can then be started again, using the same water, is very simple in principle and construction and makes an attractive feature for a show window. The fountain may be constructed entirely of sheet metal, or may have wooden supports, says the Metal Worker. The one illustrated here has the wooden supports.

Fig. 1 shows the details of construction. To make the bodies of the reservoirs B and C, procure a sheet of roofing tin 20x28 in., cut into two pieces 10x28 in. and bend to shape. Form the tin tubes H, H, F, F, G, G on a gutter beader and solder them perfectly tight. Use an ordinary 12-in. wash basin for the part A, and make a 2-in. hole in the bottom of it, under which screw a 1½ in. can screw top, N. Adjust the overflow pipe H so that it extends through a hole in the can screw under the basin through reservoir B, to within ¼ in. of the bottom of reservoir C. Arrange tube F to extend from within ¼ in. of the top of reservoir B through reservoir B, through can screw K, into reservoir C for ¼ in. Have tube G, from within ¼ in. of the bottom of reservoir B, extend upward through can screw N, and



end in a nozzle even with the top of the basin. At L insert a 1-in. tube, fitted with a small screw can top, for filling the upper reservoir. Use leather washers with can screws and make all joints and seams airtight.

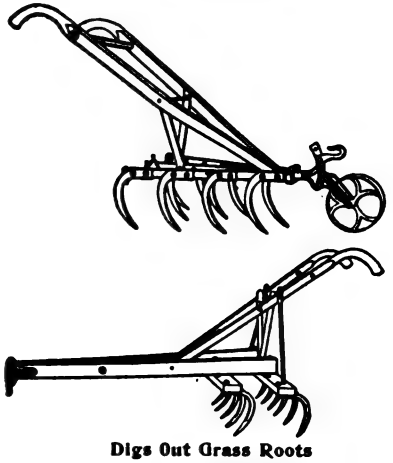
Make a circular top, M, with a wired tin rim 1 in. high. Shape the three wooden legs as illustrated and mount the reservoir within. The circular top, M, will serve as a flower stand in decorating. The fountain is now ready to operate.

Fill reservoir B through tube L with water, screw top on L, tightly, and fill the basin with water. The water will pass through tube H, force the air through tube F to the top of reservoir B and the pressure so created will force the water from reservoir B up tube G to spout out at the top in a tiny fountain. The falling water is carried from the basin by tube H to reservoir C until this reservoir contains all the water. Then the water may be drawn off at faucet J, and the upper reservoir refilled.

The nozzle for the tube G may be made of a hollow nickel stove knob and a small screw can punctured at the top with a hole not larger than a common sewing needle. The reservoirs can be larger if desired.

MACHINE FOR DIGGING GRASS ROOTS

The Department of Agriculture gives details of two handy machines for digging grass roots. These machines are very ef-



Digs Out Grass Roots

fective and can be rigged out at any blacksmith shop by taking a cultivator frame and making the teeth required as shown in the cut.

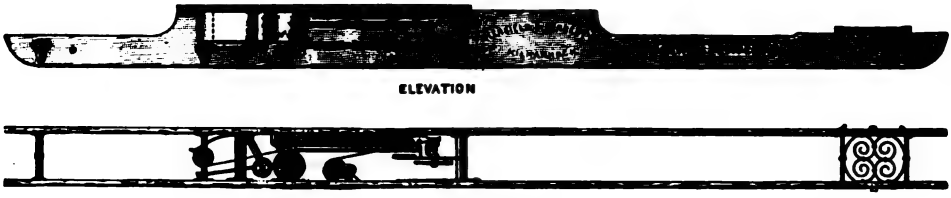
Last year this country mined 27,664,330 long tons of iron ore which was a decrease of over 7,000,000 tons over the previous year.

The "Virginian," the new Allan turbine steamship, broke the record for trans-Atlantic trips from land to land by 20 hours recently. The vessel's time was 100 hours.

THE VIAGRAPH AND HOW IT WORKS

The viagraph is an instrument which, when drawn along over the surface of a road, furnishes an exact profile of the road surface, showing its elevations and inclines with accurate measurements as to the locality and amount of any unevenness. It was invented by John Brown, of Ireland, and was first tried on the Belfast and Lisbon road in 1898. America, notorious for having the worst roads in the world, has given little attention to the viagraph or any other invention that would aid in the establishment of good roads. The Motor News, of Dublin, says:

The viagraph is in principle a straight edge applied continuously to the road surface, along which it may be drawn for (first) recording on paper a profile of the road surface, and (second) indicating a numerical index of the unevenness of the surface.



The Viagraph

A lever, pivoted to the main frame, carries on its free end a serrated wheel, near the middle of the apparatus. While the main frame in being drawn along the road preserves a sufficiently even line, this road wheel rises and falls over all the unevennesses of the surfaces, carrying with it the lever and thereby transmitting its movements by means of a link to a second lever carrying a pencil, which marks the full amplitude of these motions on the paper passing round the drum. While the motion of the pencil takes place in a vertical direction, the paper on which it marks is carried under it by the drum, which is rotated by a worm and wheel below it, connected by a shaft and bevel gear with the road wheel. The result is a profile of the road gear surface, of which the scale is full size vertically, and ⅛ inch to one foot longitudinally. A second pencil draws a datum line corresponding to that which the indicating pencil would produce from a perfectly even road. From this can be measured the depths of the ruts or "cups" or other unevennesses indicated on the diagram. Each descent of the road wheel into a rut or cup causes this counter to register the amount of the drop, the reading being given in feet per mile of road. The distance is measured off automatically by an ingenious mechanical arrangement which rings a bell when the 88 yards have been traversed.

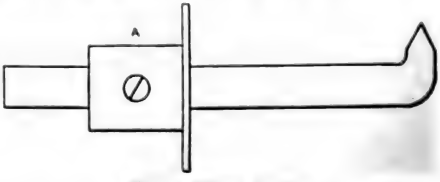
HOW TO CLEAN TRACINGS

Tracings that are badly soiled with grease spots or other dirt may be nicely cleaned with kerosene. Tack the tracing to a board and apply the kerosene gently, but liberally, to the surface, allowing it to soak a short time, and then drying off with a clean rag. Turn the tracing over and treat the other side in the same manner. Dry it on the radiator; it can be safely done. The polish will not be removed from either side of the tracing

A HANDY GLASS CUTTER

A device for cutting off gage glasses, which works almost as good as a first class diamond, is made of a piece of round ¼-in. tool steel, says a correspondent of the Engineers' Review.

Bend the steel and bring to a sharp point as shown in the illustration and then temper in oil. Make a gage collar as at A, with a projection at one end to more than



Water Glass Cutter

cover the end of the glass. Hold the gage in place with a screw.

To use the device with a glass, let us say, ½ in. longer than required, slip the gage, A, up on the cutter till ½ in. from the cutting point and turn the instrument around in the glass.

HOW TO BUILD AN OVERSHOT WATER WHEEL

In building a water wheel, the "overshot" wheel, or one taking water at the top, is the most powerful, the cheapest, and best adapted to ordinary requirements. The construction of an overshot wheel is very simple, though each individual builder must proportion its size to the fall of water available to him, and the amount of power he desires to obtain.

A 15-ft. fall would require a wheel about

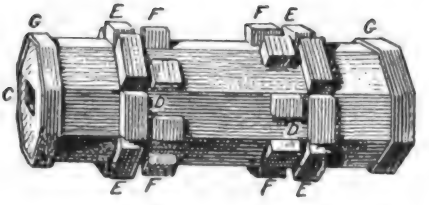


Fig. 1

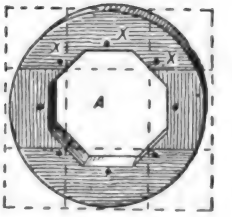


Fig. 2

10 ft. in diameter, and the space between the buckets must be equal in order to keep up a steady motion, while each person must adapt the depth of the buckets to the volume of the water. Hardwood should be used for the whole structure. Oak is the best wood for the purpose, but if this cannot be obtained, hard rock ash or hard rock maple may be used for the more important parts.

The first part to make is the shaft, Fig. 1;

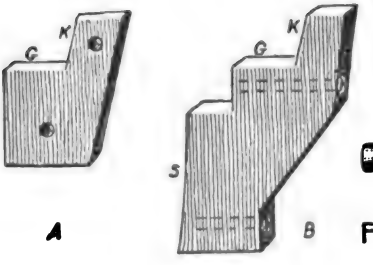


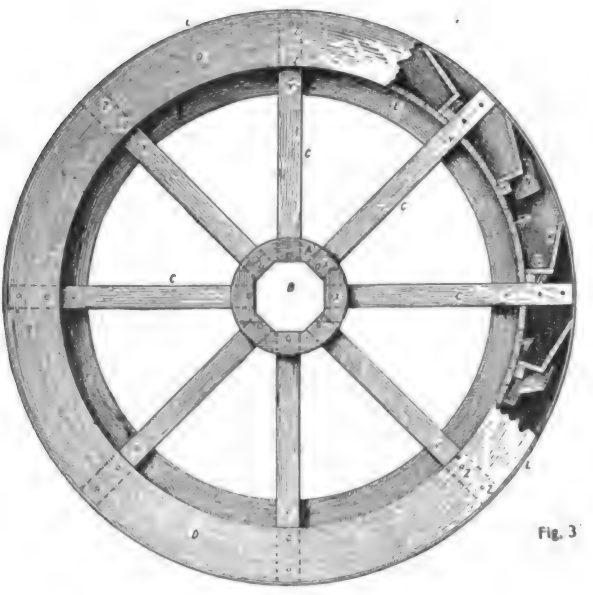
Fig. 4

make this with eight sides and with a square hole in the ends, as at C, for the "gudgeons" or journal pieces. Fasten these pieces in the shaft by means of bolts passed through holes at D D. Near the ends of the shaft, fasten by wooden dowels, blocks, as at E, E, etc., and just within these blocks place other blocks, F, F, etc., fastened by dowels also; the blocks on one end being on opposite edges of the planes of the shaft to those of the other. These smaller blocks are for the purpose of securing the feet of the diagonal braces, which assist in holding the spokes of the wheel upright; they are placed on opposite edges of the planes to permit the stays to cross without interfering. To prevent the shaft's splitting, place an iron band, G, 2 in. or more wide and ½ in. or more thick on each end, and secure each band with four lag screws on alternate planes. A shaft from 18 to 24 in. long is of a good size. The use of wooden dowels is better than spiking for fastening blocks, etc., says a correspondent of the Blacksmith and Wheelwright, as the dowels swell and shrink with the wood of other parts and give off no rust.

To make the hubs, Fig. 2, of which there should be an inner and an outer one for each end of the shaft, frame each of them together in four pieces in the form of a square as shown by the dotted lines in Fig. 2, and cut the hole the proper size for adjusting on the shaft. The hubs may be left square or rounded off, as desired. Make holes as at X, X, X, etc., for securing the spokes to the face. Place the inner hubs on the shaft first and secure them to the blocks, E, by means of dowels at the holes, X.

Fasten the spokes, C, C, C, Fig. 3, to the inner hub and then put on the outer hub (A, Fig. 3), and fasten it at X, X, X, etc., to the spokes and inner hub. The outer rim (D, Fig. 3), may now be put on. This rim should be deep enough to form the outer ends of the buckets. In the inner rim,

E, the outer periphery equals the inner periphery of the outer rim, D, and this inner rim is used to fasten the sheathing, T, which forms the bottoms of the buckets, to. Fasten the inner rim, E, in place on the wheel and sheath it with tongue and grooved hardwood pieces 1½ in. or more thick, and doweled in place. Fasten on cleats (F, F, F, etc., Fig. 3), running all the way across and secure them to sheathing with dowels.



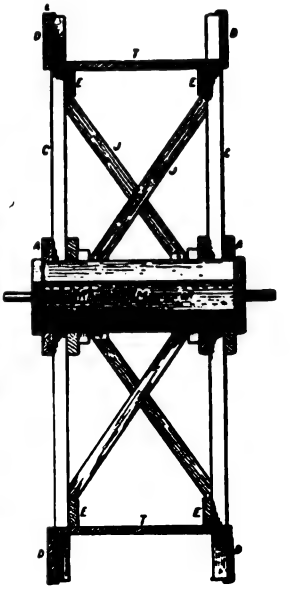


Fig. 3

A section of a bucket is shown at G, K. Fasten the bottom of the bucket, G, to the cleats, F, and the outer web, K, of the bucket, to the rim, D, and the inside web or bottom, F. An iron band, L, on the outer rim and covering the outer web of the bucket one inch, may be used as an additional security, if desired. Blocks for supporting buckets are shown in Fig. 4. The form of block at A may be fastened to the inner side of the rim; the one at B may be used at the center. The surfaces, G and K, would support the webs of the bucket marked G and K in Fig. 3. To conform with the sheathing, the side, S, of the block, B, is cut with a sweep. Fig. 3 shows such blocks in position at N and P.

The diagonal stays for supporting the spokes are shown in the sectional view at Fig. 3. M is the shaft, C the spoke, and J the stay from shaft to spoke. In Fig. 4, at C is shown the gudgeon pin or journal. The square part, T, is let into the end of the shaft and is held by the bolt passing through the shaft and gudgeon at R. The iron should be at least 2½ in. in diameter. Secure short posts to the "mill" posts outside and then secure a transverse piece into which to fasten the boxes. Oil may be fed through a metal tube from the top.

For transmitting the power of the wheel, fasten a gear wheel to one end of the shaft outside the spokes. Probably the best means is to secure an eccentric disk or wheel to the end of the shaft and use a wooden pitman or connecting rod to apply to the machinery above. The power developed by such a wheel depends on the volume and fall of the water.

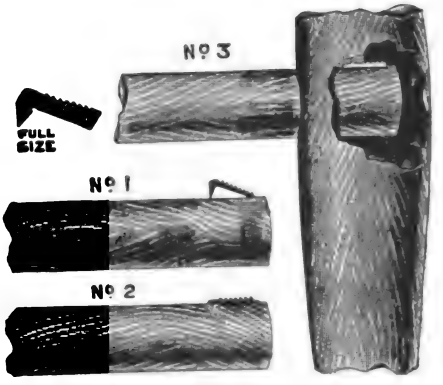
FILLER FOR HARDWOOD

Make a very thick paste of boiled linseed oil and powdered starch; add a little japan and then with oil of turpentine reduce to working consistency. For dark ash and chestnut, add a little raw sienna, says the Master Painter; for walnut, add burnt umber and a little Venetian red. For white oak or white ash no color is required; for other woods, use enough color to cover the white of the starch. Apply with a brush or rag; let stand a few days, then sandpaper.

A grease spot on wood can be removed by using a saltpeter or a thin lime wash, then rinsing with clear water. If necessary, repeat the process.

REPAIRING CHAIRS

For repairing chairs and other light articles of furniture, there are several little devices that may be purchased at the hardware store more cheaply than they can be made and thus insure a neater job.



The Dowel Fastener

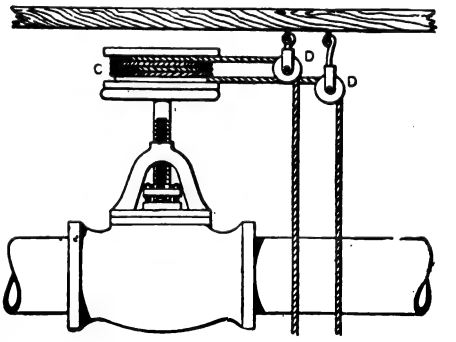
Among these, says the Furniture Journal, is the dowel fastener, a small barbed piece of steel which is driven in beside the dowel pin and prevents its coming out. Mending plates of steel with countersunk holes are convenient, also, and for holding legs in chairs a piece of steel with a sharp point for driving into the chair leg and a screw hole to fasten it to the seat of the chair is provided. There are various sizes and shapes of corner irons for strengthening weak places.

PASTE THAT WILL NOT SOUR

A paste that will not sour, says a correspondent of the Master Painter, is composed of 3 qt. flour, 3 teaspoonfuls powdered alum and ½ teaspoonful powdered blue vitriol. Mix in dry state and make in the usual way. Safe to make up a barrel of this paste at a time.

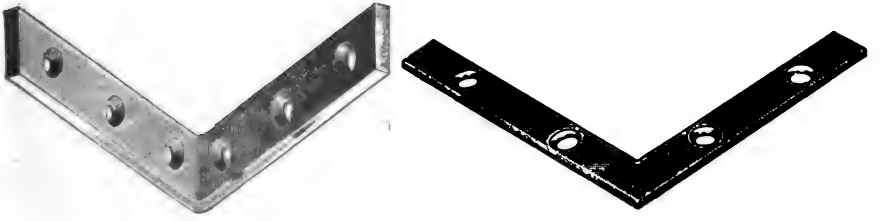
VALVE OPENING AND CLOSING DEVICE

A valve that had to be opened several times every day was very difficult to get at, being in the position shown in the sketch. A correspondent of the Engineers' Review tells how he rigged up a device by which the valve could be opened or closed without climbing up to it on a ladder.



Valve Opening and Closing Device

A wooden wheel, flanged, was turned and bolted to the valve wheel, as at C, with ¼-in. bolts, having the heads cut off and bent in the shape of a hook, in order to lap around the arms of the valve wheel. A length of ⅜-in. rope was wound around the wooden wheel, giving it enough turns to open or close the valve without having the rope bring upon the part of the valve to which the pulley was fastened. Small pulleys, D, D, were suspended from the beam by screws and the rope passed over these, as shown, to bring it down within easy reach and prevent its running off the pulley. An endless rope was used and by pulling one way or another on it the valve can be opened or closed as desired.



Corner Irons for Bracing Chair Legs

ANOTHER AUTOMATIC FURNACE TENDER

As nearly all furnaces have a lever, B, Fig. 1, to close the draft and open the check when the steam reaches the point set for, Fig. 1 will be easily understood.

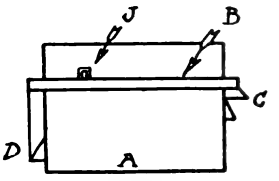


Fig. 1

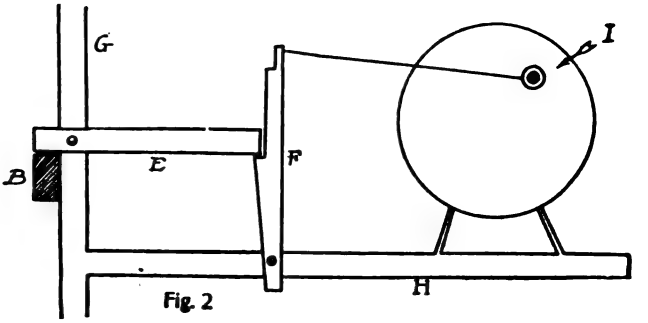


Fig. 2

The arrangement in Fig. 2 is intended to be placed at about the point J in Fig. 1. It consists of an upright 1 in. by 3 in., having a shelf H, on which the clock is to be set, nailed to it. The levers, E and F, are both of band iron, though wood could be used if preferred. A slit is sawed in a small spool, so it can be pushed on the alarm wind and the apparatus is then set as indicated, the lever B being placed under the outer end of F, the alarm set for the time desired, and a small string run from F to the spool on the alarm at I. When the alarm goes off, the string pulls F from E and E falls to a perpendicular position releasing B, thus closing check. This device can be rigged up in two hours, is simple and one can always be sure of a fire.—Contributed by H. E. Gregory, Waverly, N. Y.

WATERPROOF CEMENT RECIPES

1. White lead, red lead and boiled oil mixed together with a good size to the consistency of putty.

2. Dissolve 1 oz. powdered resin in 10 oz. strong ammonia and add 5 parts gelatine and a 1-part solution of acid chromate of lime.

3. For a waterproof paste cement, add to hot starch paste one-half its weight of turpentine and a small piece of alum.

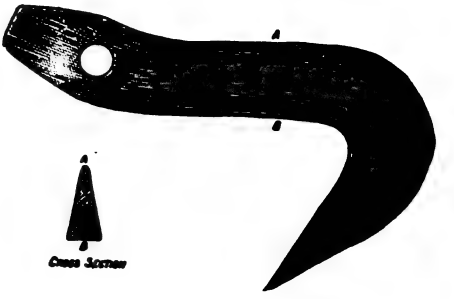
4. For lining cisterns, make into a paste with boiled oil, 2 parts each of powdered brick, quicklime and wood ashes.

TO SOFTEN DRIED PUTTY

Putty that has dried hard as rock can be softened as follows: Pound it with a common hammer on a smooth, hard surface, add a little linseed oil and it can then be worked with the hands easily and will be as good as when fresh.—Contributed by H. N. Pond, Topeka, Kan.

FORGING A LUMBER DOG

The lumber dog shown in the sketch is made of steel ⅞x2x13 in., punched at one end and drawn out as if for sharpening a chisel. It is then bent about two-thirds of the way round and the back drawn down



Forging a Lumber Dog

as thin as possible, but still leaving the point full width of the steel, or ⅞ in. This kind of dog is commonly used in Oregon, says a correspondent of the Blacksmith and Wheelwright.

TO DEODORIZE BENZINE

To 1 gal. benzine add 3 oz. quicklime. Shake well; let lime settle; pour off and filter the benzine.

AN AIR-BOUND PIPE LINE

Some time ago I laid a line of 4-in. pipe about 3,000 ft. long, says a correspondent of Power. The first 1,000 ft. gave me a fall of 530 ft.; the rest of it was comparatively level. As the pressure was not required and some of the pipe not very good, I did not put in any valve, but piped direct to a tank having a large enough overflow to take care of any excess in case of the mill shutting down. When everything was completed, the water was turned in, and after waiting some time we were somewhat surprised that no water came to the mill. I had had a similar experience before, but never when there had been so much pressure, and was inclined to think something had gotten into the pipe. However, I took a sharp pick and hunted the high places. When I found one very prominent, I stuck the pick into it. After finding about a dozen of them, the water came all right. I have since lowered the high places when possible, and put in petcocks where I could not level the pipe, and have had no more trouble.

STEAMING OUT SPLINTERS

When a splinter has been driven into the hand it can be extracted by steam. Fill a wide-mouthed bottle nearly full of hot water, place the injured part over the mouth and press it slightly. The action thus produced will draw the flesh down, and in a minute or two the steam will extract the splinter, also the inflammation. Try it and be convinced.—National Magazine for June.

HOW TO RESPOKE A METAL WHEEL

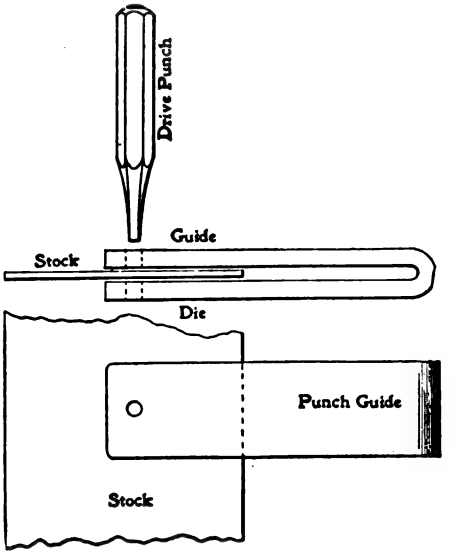
For a threshing machine wheel, ⅝-in. iron rod is the stock to use. Cut the spokes ½-in. longer than the required length and upset them in the hub, marking each one so it will be put in the right place. Cut threads at the outer ends of the spokes and use jam-nuts.

Drive the spokes in the hub and true up the wheel with jam-nuts, tapping the spokes in the meantime. When true, head the spokes and see that all the nuts are tight. A correspondent of the American Blacksmith says he respoked a wheel of a 50,000-lb. threshing machine in this way four years ago and that it is solid yet.

Spokes can be removed from buggy wheels by the following method: Place the spoke in the vise with the inside of the wheel up; place a short block of wood against the hub above the spoke and strike with a 6-lb. sledge. One blow will bring it. A piece of felt will protect the paint.

HAND PUNCH FOR SHEET METAL

This device for punching holes in sheet metal is extremely simple and will be found a great convenience to those who possess no punching machine, says a correspondent of the American Machinist. The guide consists of a bit of steel doubled over with a free hole drilled through the ends. The illustration is self-explanatory.



Convenient Hand Punch

That device that saved you so much trouble the other day would help your brother mechanic, if he but knew about it. Send us a sketch and brief description.

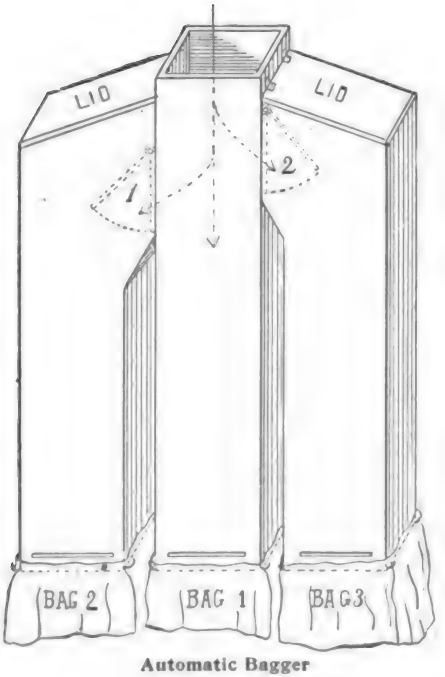
A blueprint is ready for washing when a slightly moistened finger touched to it, leaves a mark nearly purple.

Coal containing a large amount of carbon gives the best heat; the oxygen being combined with hydrogen as water is of no value. An excess of hydrogen in gas coals, however, is an important item in the production of heat.

HOW TO MAKE AN AUTOMATIC BAGGER

The sketch shows an automatic bagger for elevators and mills that will fill three bags in succession without attendance. The device is very simple in construction and works as follows:

The stock falling through the central



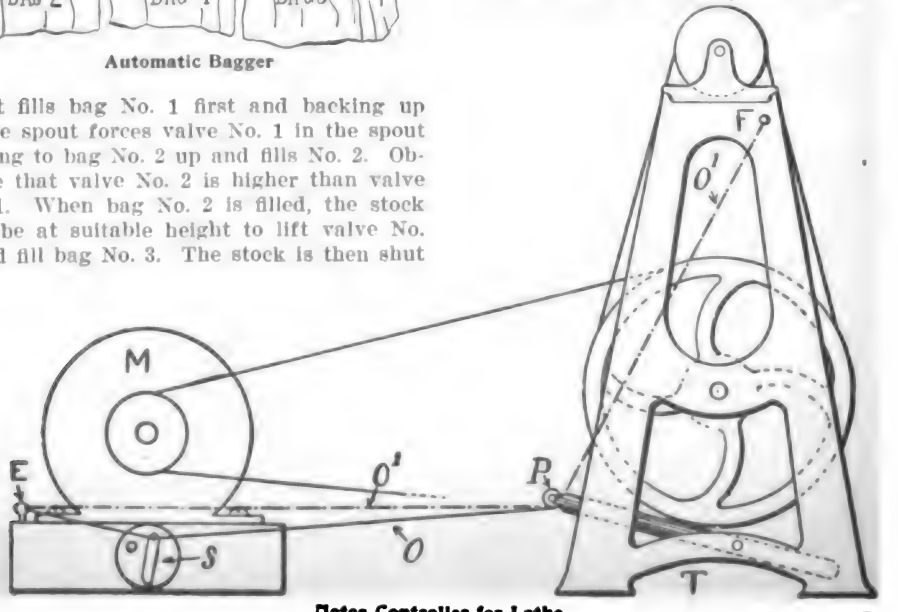
Automatic Bagger

spout fills bag No. 1 first and backing up in the spout forces valve No. 1 in the spout leading to bag No. 2 up and fills No. 2. Observe that valve No. 2 is higher than valve No. 1. When bag No. 2 is filled, the stock will be at suitable height to lift valve No. 2 and fill bag No. 3. The stock is then shut off and empty bags replaced for the filled ones.—Contributed by F. S. Cummings, 239 Forsyth Ave., Detroit, Mich.

RUNNING THE LATHE WITH A MOTOR

The accompanying illustration shows how Eugene F. Tuttle, Jr., of Newark, Ohio, connected up a small footpower wood-turning lathe with a $\frac{1}{10}$-hp. electric motor. The lathe treadle, T, was disconnected from the flywheel, and the flywheel was then belted to the motor, M. On the base of the motor was mounted a one-point switch, S, which was connected up as indicated.

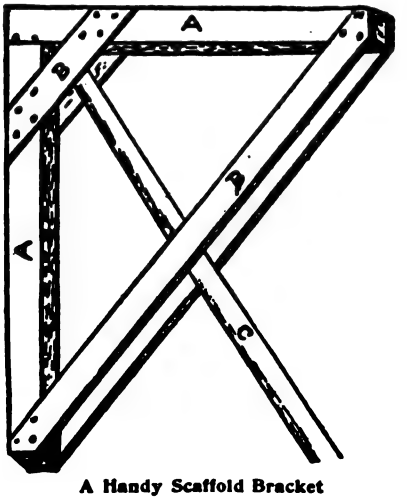
A small pulley, P, large enough to turn in the place where the driving rod works on the treadle, T, was made and put in place and a cord, O', was run from the switch, S, through a screw-eye, E, under the pulley and up to the bed of the lathe, where it was fastened at F. When the front of the treadle is depressed it pulls on the cord, O', and opens the switch. The switch is closed by another cord, O, running from the switch direct to the pulley where it is fastened at the side of the pulley. This string must be kept tight to give satisfactory results. The switch may be obtained of any electrical dealer and should have a 1½ or 2-in. spark gap when opened. The arrangement has been in use two years with no repairs, excepting new cords.



Motor Controller for Lathe

A HANDY SCAFFOLD BRACKET

In the scaffold bracket illustrated here, A A are pieces of 3x4; B B, pieces of inch board, and C is a long pole used to elevate the bracket to some high or difficultly

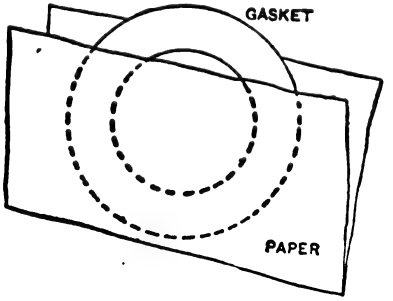


A Handy Scaffold Bracket

reached part of a building where it is to be used. The foot of the pole, says the Master Painter, may be secured by a stake driven into the ground. Two or three poles, with a board or more across, can be raised simultaneously and a safe scaffold is up ready for use.

HOW TO CUT AND APPLY GASKETS

There are a few simple kinks which, if observed in cutting and applying gaskets, will make the work much easier, says a correspondent of Machinery. While cutting the rubber, have a dish of water at hand and keep wetting the cutter. Excellent results may be obtained by this method on rubber gaskets 1 in. thick. A gasket



Method of Inserting Gasket

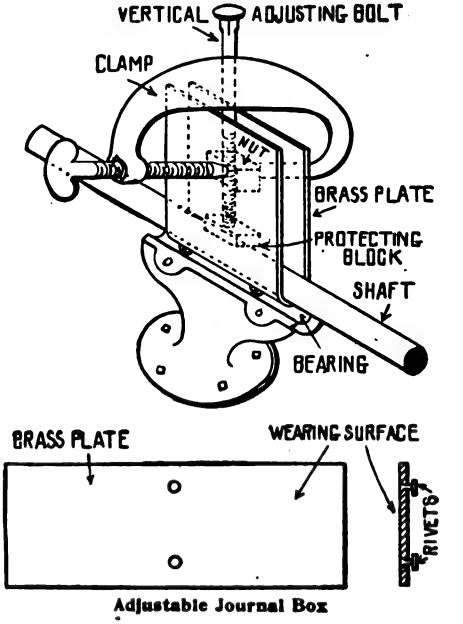
will be much more easily removed should the joint break, if the flanges are chalked at the time the gasket is put in place.

Where two flanges cannot be separated any great distance and there is trouble in inserting the gasket, place it between a folded sheet of paper as shown in the sketch, and it will go in more easily. After some of the bolts have been entered, tear out the paper.

BABBITT JOURNAL BOX KINK

A babbitt journal box with a brass wearing surface for either large or small shafts, may be made as follows:

Have the brass of suitable thickness and length for bending around the shaft, and at



Adjustable Journal Box

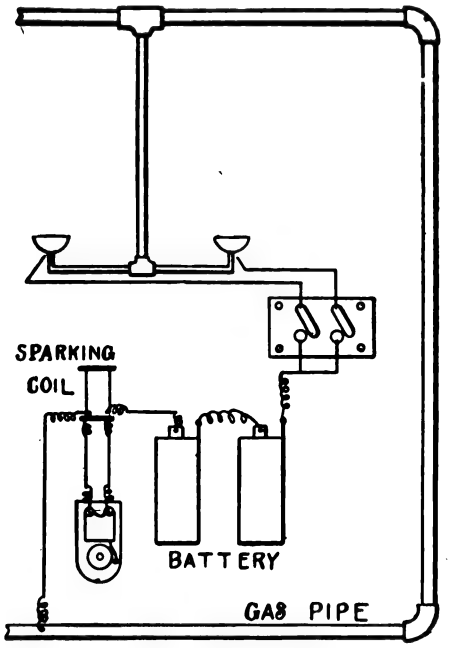
the center of the plate drill and countersink holes for soft metal rivets, having heads that project slightly, so the filling of metal can take hold. The countersink is for the small end of the rivet. Smooth down to fit shaft, and in case of rivets being too large, after bending follow up the dents near the rivets with gentle tapping.

Where the shaft can be had of suitable temperature the smooth plate can be treated in the usual way by soldering on the under side and near the rivets. After filling with the babbitt metal, let cool and then file off any surplus brass. Then, in case of

overheating, the rivets will hold the brass, if the heads project far enough. This box may not be suitable for all shafts, such as conical shapes, etc.—Contributed by August Rinne, 937 Alameda St., Los Angeles, Cal.

WANTS TROUBLE ALARM PLAN

The accompanying sketch is sent us by W. Williams, of 100 Stockton St., Brooklyn,



What's the Matter?

N. Y., and is a plan of an electric gas-lighting system of five burners, which he has installed in his house. Mr. Williams wishes to know how to connect a bell with this system, so that, if there is any trouble on the line—a short circuit or a ground—the alarm will sound. Can any one offer a suggestion? With the wiring indicated the alarm worked for awhile, but finally stopped.

HOW TO MAKE GRAFTING WAX

A good grafting wax can be made by breaking up fine 4 parts resin and 2 parts beeswax and melting them with 1 part of tallow or linseed oil. When thoroughly melted, pour the liquid into a vessel of cold water. When it is hard enough to handle, take it out and pull and work it until it becomes tough and of the color of very light manila paper. The wax may be applied hot with a brush, says a bulletin of the Department of Agriculture, but care must be taken to avoid injury. If applied by hand, first grease the hands with tallow. Spread the wax over all cut or exposed surfaces and press closely, so that when cool it will form a coating impervious to air or moisture.

To make waxed string, put a ball of No. 18 knitting cotton into a kettle of melted grafting wax. In five minutes the cotton will be thoroughly saturated and will remain suitable for use indefinitely.

SHADE FOR ELECTRIC LIGHT

Procure a piece of tin of suitable size and strike out a circle on it about 8 or 10 in. in diameter, and a smaller circle 1½ in. in diameter in the center of the first circle, as shown in Fig. 1. Cut out the large circle with a pair of shears and cut an opening in it, as shown at A, Fig. 1.

Punch out the center circle by means of a punch and finish it round with a file. Fold the edges together and solder or rivet,

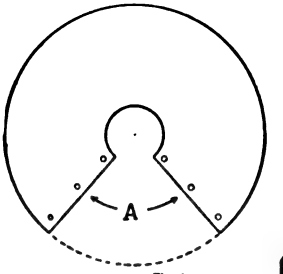


Fig. 1

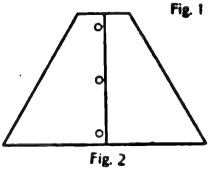


Fig. 2

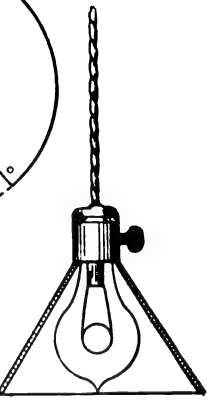


Fig. 3

as in Fig. 2. To adjust the shade to the lamp, put the lamp up inside the shade, so that the end that screws into the socket projects through the opening at the top and then screw the lamp into the socket. The large part of the lamp will prevent the shade from coming off (Fig. 3.) Such a shade is cheap, easy to make and answers all purposes. The exterior of the shade may be painted green if desired.—Contributed by W. J. Slattery, Emsworth, Pa.

All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

CHEAP PAINT FOR ROUGH WALL SIGNS

A solution consisting of green vitriol stirred into lime milk makes an excellent cheap yellow coating for large signs on rough dead walls, rocks, cliffs, etc., says the Master Painter. The paste will be green at first from the separating protoxide of iron, but after it is applied and dry will become yellow by oxidation in the air. It adheres firmly to any surface and will not wash off. The color is darker or lighter, according to the amount of green vitriol used.

HOW TO FASTEN A RING TO A ROPE

The writer has used the method shown in the accompanying drawing in fastening a halter rope to the ring of the halter, but it is apparent that the method applies to any similar case where ropes and rings are used.

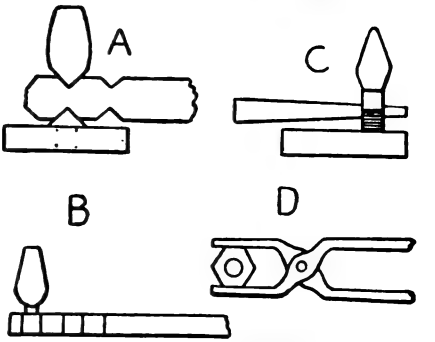
The advantage is that the ring has two thicknesses of rope to wear through before a break can occur. The free end of the rope is fastened down to the other with a cord or wire. If heavy wire must be used, it may be wrapped as tightly as possible and then hammered flat. — Contributed by Joseph B. Keil, Marion, Ohio.

PIERCING PUNCH OF PIANO WIRE

Piano wire makes an excellent piercing punch for piercing holes in sheet metal, says a correspondent of the American Machinist. The punch is rather difficult to make, but is good for piercing holes of the same diameter as the thickness of the metal, or when the metal is unusually tough.

HOW TO MAKE SIX-SIDED NUTS

Good iron will be required for this purpose as poor iron will not stand the thread cutting. Take a piece the size the nut is to be and cut the nut. Do not cut from the

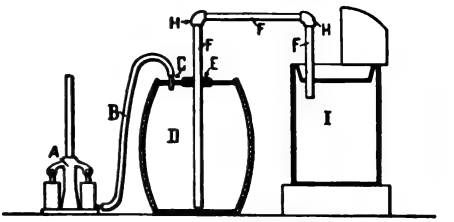


Making a Six-Sided Nut

flat side, says the American Blacksmith, but hold the iron on the hardy as shown in the illustration at A. B shows the punching operation, C finishing the shape and D shows a pair of tongs for holding the nut, which must be made thinner, as ¼ in. is a little too thick. Finish the nut on a pin from 16 to 18 in. long.

EMPTYING AN OIL-BARREL

The illustration shows a method of emptying oil from the barrel that will do the



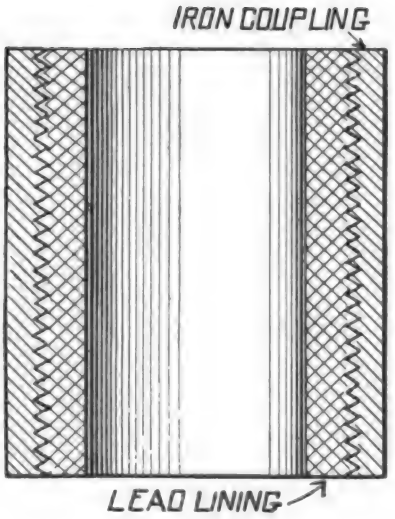
Emptying An Oil Barrel

work in from ten to fifteen minutes. The apparatus includes the following parts:

A, pump (any old pump will do); B, hose; C, bush on hose; D, oil barrel; E, large bushing; F, ¾-in. pipe; H, ¾-in. elbow; I, oil tank. The oil is forced out by air.—Contributed by Alex Mattley, Menominee, Wis.

PIPE CLAMP THAT WILL NOT CRUSH OR MAR PIPE

Having occasion to do some pipe fitting with brass and nickel pipe I made use of the following kink to hold same in an ordinary pipe vise, the object being to grip the pipe



Safe Pipe Clamp

tightly, but not mar or scratch or even crush it, as an ordinary pipe vise would:

The clamp is made of a common iron coupling one size larger than the pipe to be held, i. e., for ¾-in. pipe use a 1-in. coupling. Slip the coupling over the short piece of pipe, and using the pipe as a mandrel, pour melted lead around it, filling up the coupling. When cool, slip the coupling off the pipe and saw it in halves, using a back saw. You will now have a clamp made of two halves, one of which is shown in the illustration. When using sprinkle the clamp with plaster of paris and you will get a never-slip grip. The threads of the coupling are all that is required to hold the lining. It is cheaper to make a whole set of these clamps than it is to buy a special machine.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.

SIZE FOR PLASTER WALL

Boil flaxseed in water and apply to the wall, or it may be applied over a first coating of paint. This size is useful on wood, also.

HOW TO ESTIMATE WEIGHT OF WROUGHT IRON AND OTHER METAL BARS

The weight of a bar of iron, steel, copper, lead or brass may be very quickly and quite accurately estimated by the following formula. Multiply the dimensions and add one cipher to the result. Then divide by 3 and the final result is the weight in pounds.

For example: Take a bar of wrought iron 20 ft. long by 2 in. thick by 4 in. wide, and we have 20x2x4=160. Add a cipher, which gives 1,600 and this divided by 3 gives 533⅓, which is the weight in pounds.

For cast iron deduct 1/16 from the weight of wrought iron.

For steel add 1-48 to the weight of wrought iron.

For copper add 1-7 to the weight of wrought iron.

For lead add ⅛ to the weight of wrought iron.

For brass add ⅛ to the weight of wrought iron.

Contributed by Anthony Haselman, Newark, N. J.

A HOOK KINK

Fig. 1 shows a common hook whose bad feature is that when hoisting, point A catches on any projection it may encounter. If the eye is turned around as shown in the side view, Fig. 2, point B will strike a projection

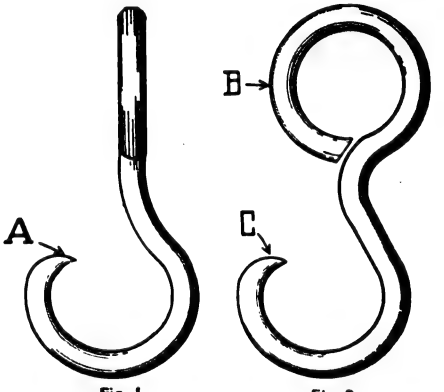


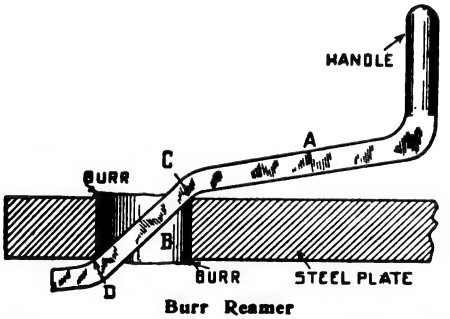
Fig. 1 Fig. 2

first. This will cause the hook to bounce off and point C will safely pass by the projection.—Contributed by John Weldon, 433 Columbia St. Brooklyn, N. Y.

A gill of shellac varnish added to a gallon of asphaltum is a good hardening agent.

HANDY BURR REAMER

When rolled steel plates have been drilled, especially ones 1½ in. or more in thickness, they have a burr around the upper and lower edge of the hole. A reamer that will quickly cut these off and save a lot of chiseling may be made as follows:



Burr Reamer

Have the blacksmith bend a piece of ½-in. square tool steel, about 15 in. long, to the shape shown in the illustration at A. Temper this device, grind it square and sharpen at the points C and D, where it is to cut the burrs. Place this reamer in the drilled hole (B in the sketch) and turn it round and round a few times until it has cut the top and bottom edges of the hole smooth.—Contributed by W. J. Slattery, Emsworth, Pa.

DRESSING OIL OR WHETSTONES

When it is necessary to dress oil or whetstones, level them on the emery wheel, holding them on the flat face. This requires from three to five minutes and makes them like new stones.—Contributed by J. W. Brown, Rensselaer, Ind.

ADVANTAGES OF ZINC ROOFING

The advantages of zinc roofing over other roofing materials is receiving more or less attention in this country of late. The claims for the superiority of zinc for this purpose is based on its tenacity, its density, its durability, the fact that it is not inflammable and that a thin coating of oxide forms upon the zinc when exposed, this coating being insoluble in water and becoming a permanent protection, preventing further corrosion and doing away with the necessity of painting the roof.

Zinc is one and one-half times lighter and four times stronger than the same substance of lead. Old zinc when stripped from a roof is said to be worth one-half its original value.

The largest zinc sheets used for roofing are 8x3 ft. in size, 0.053 in. thick, and weigh 1 lb. 14 oz. per square ft The roof must be laid so as to give the material plenty of play, as the expansion and contraction of zinc is greater than that of any other metal. Under extremely high temperatures zinc gives off a bright green flame, which fact has given rise to the belief that it is inflammable.

CONVENIENT CENTER GAUGE

The sketch shows a method I have found very convenient, and which will be understood from the drawing, for truing or lining

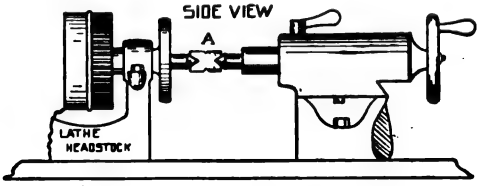


Fig. 1 SHOWING GAUGE ON LATHE CENTERS AT A.

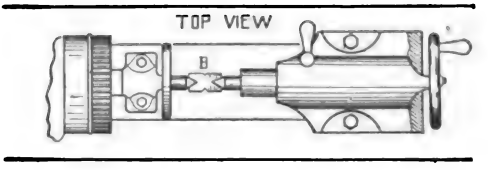


Fig. 2 WITH GAUGE ON CENTERS AT B.

up the centers in an iron turning lathe. By taking a piece of sheet steel 3/64 in. in thickness any skilled machinist can make one in a short time. This device can be used for thread tool centering as well as lathe centers at 60 deg., graduated pitch. This gauge

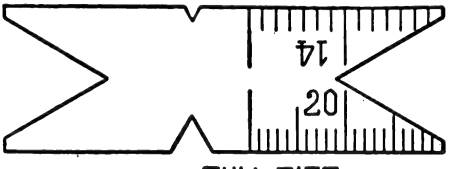


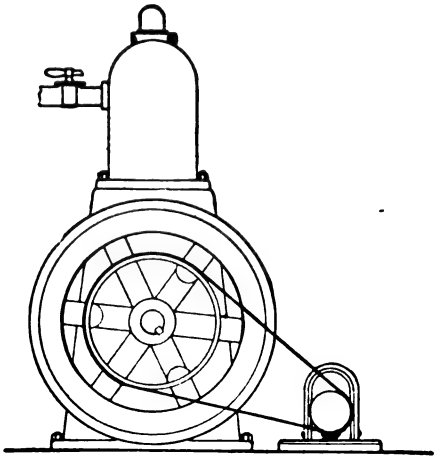
Fig. 3 FULL SIZE

can be graduated the same as any other center gauge; on one side 14ths and 20ths, and on the other 24ths and 32nds in fractions of an inch.—Contributed by F. M D., Rock Falls, Illinois.

Rubbing a window pane with fine sand and water will make it obscure, yet diaphanous, says the Master Painter. Another method is to cleanse the glass thoroughly, then moisten it with hydro-fluoric acid. When the acid has eaten the glass enough, wash it off with plenty of clean water.

FIRING A GAS ENGINE WITH A TELEPHONE MAGNETO

The magneto out of an old broken telephone can easily be used, instead of batteries, for running a gas engine. The batteries are usually a source of trouble, especially if the engine is used very much.



Magneto Connected to Engine

To connect the magneto, saw out a pulley a little narrower than the large cog-wheel on the machine and ¼ in. thick. Then screw off the handle and bore a hole in the center of the pulley large enough to fit the screw from which the handle was taken. Now screw on the pulley and you will find it will hold very securely. Fasten the magneto to a block of wood and nail the block to the floor. Take an ordinary sewing machine belt and connect it around the main pulley on the engine, and a V-groove on the wooden one of the magneto.

To make connections take the two wires from the magneto and join them to a spark coil and from there to the engine.—Contributed by E. H. Klipstein, 116 Prospect St., East Orange, N. J.

SOLDER FOR ALUMINUM

What is reported to be the most successful solder for aluminum yet secured, consists of tin 64 parts by weight, zinc 30 parts, lead 1 part and aluminum 1 part, to which add a small portion of resin. To solder, clean the surfaces and face with the solder. No chemical is used, but the surfaces of the parts to be soldered should be gently heated to assist in making a good adhesion.

USE OF THE COMPASS IN LOCATING POLES OF A GENERATOR

Numerous letters have reached us asking if the following statement, which recently appeared in this magazine is not a mistake. The statement was:

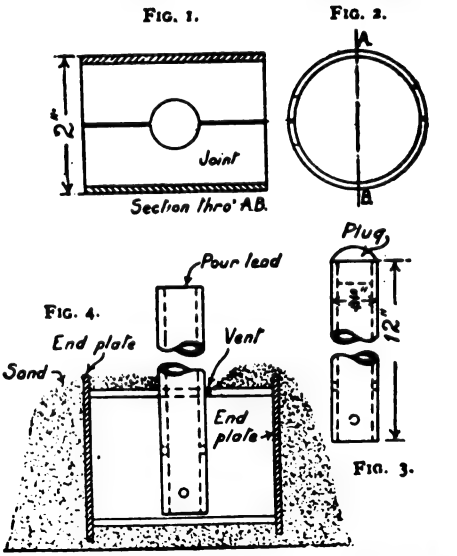
"While the dynamo is in service, bring the north-seeker end of a compass needle near each of the poles. Those that attract this end are north poles and those repelling it are south poles."

What has misled is the common mistake of calling the north-seeking end of the compass needle a "north pole." In reality that end of a compass needle is the south pole of the compass; otherwise it would not seek the north magnetic pole of the earth, because like poles repel. Hence when a compass is brought within the influence of a generator that is the north or positive pole of the generator which attracts the north-pointing end of the compass needle.

HOW TO MAKE A LEAD HAMMER

Lead hammers are useful when assembling parts which it is important not to mar. Such a hammer can be made in the shop, says a correspondent of the Model Engineer, London.

In the center of a piece of 2-in. tube, 3 or 4 in. long, drill a ¾-in. hole and then, cutting through the center of this hole, saw the tube in two. Through a foot-length of ¾-in. tube, drill two ⅜-in. holes at right angles to



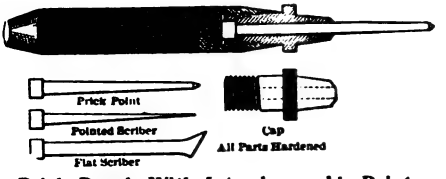
Details of Lead Hammer

each other, one ¾ in. from one end of the tube and the other 1½ in. from the same end. This last tube is for the handle.

Procure some ordinary moulder's sand and bed the two halves of the large tube in it, so that the sand holds the two parts together. Into the ¾-in. hole in the large tube insert that end of the handle tube that has the two holes. Against each end of the 2-in. tube, place a piece of tin to keep the molten lead from running out. Bank up the tube and ends well with sand, leaving a vent hole on top for air to escape. Pour molten lead down the inside of the handle until the large tube is full. When cold remove the halves of the large tube and the lead head will be secured to the handle by the two ⅜-in. holes in the handle. Fig. 1 is a sectional view of the 2-in. tube; Fig. 2 is an end view of the same; Fig. 3 shows the handle, and Fig. 4 shows mould with handle, ready for casting. File around the edges of the outer end of the handle.

INTERCHANGEABLE SCRIBER POINTS FOR PRICK PUNCHES

The prick-punch shown in the illustration is made so that a number of interchangeable scriber points may be substituted as required. This is a handy tool for the portable kit of a traveling mechanic. Its principal advantage, says a correspondent of Machinery, is that the point can be kept sharp easily, since the cross-section does not increase in size much up to the holder. A



Prick Punch With Interchangeable Points

point can be substituted for one that has been ground away without going to the tool dresser.

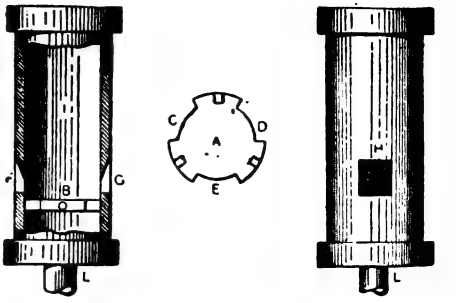
FILLING FOR CRACKS IN FLOOR

Cracks in a new floor that is to be stained and varnished may be filled with a putty made as follows. Dissolve 2 parts common glue in 14 parts water, then mix in 4 parts plaster of paris and 2 parts litharge.—Master Painter.

HOW TO MAKE A WHISTLE FOR A STEAM PLANT

In a plant where there is no whistle this convenience can be contrived out of a piece of 4-in. brass pipe 1 ft. long. A correspondent of the Engineer's Review tells how to make such a whistle.

Make a center piece, A in the sketch, out of a piece of brass and drill three holes in it.



Home-Made Whistle

File away three sides of this disk, C, D and E to provide for steam passages. Make holes in the tube to correspond to those in the disk, fit the disk in the tube as at B, Fig. 1, and run pins through the holes in the tube to those in the disk. Cut the pins off even with the outside of the pipe and solder firmly.

Above the steam passage in the disk and in line with them file three rectangular holes, F, G, in the brass pipe. On the upper side file the edges down to form a sharp lip (H, Fig. 2). Fit round disks to the top and bottom of the whistle having the lower one drilled and tapped for a steam pipe, L. This whistle makes a sound that can be heard all over the plant.

STEEL-BLUE ENAMEL FOR ANY METAL

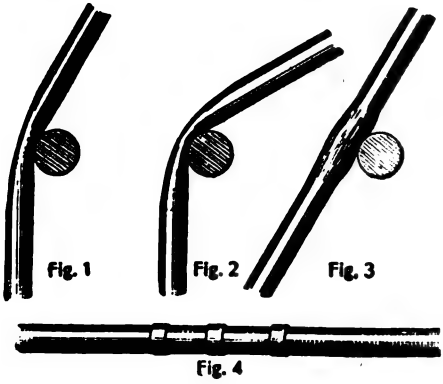
An enamel for use on any metal and which will keep so long as it is tightly corked is made as follows:

Dissolve 1 part of borax in 4 parts of water. Macerate 5 parts bleached shellac in 5 parts of alcohol, saving out a small portion of the alcohol for dissolving methylene blue of sufficient amount to give the color desired. Heat the watery solution to boiling and, constantly stirring, add the alcoholic solution. Stir out all lumps and add the blue solution. Before applying, clean the metal bright with an emery cloth. Apply enamel with a soft brush.

TOOLS AND DEVICES FOR BENDING PIPE

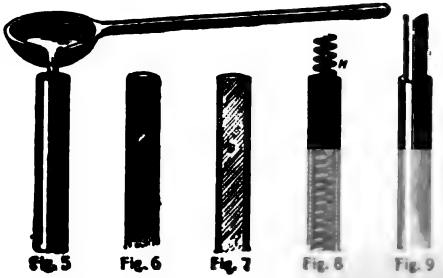
A corner fitted up with tools and devices for working with and bending pipe will be found a convenient and profitable department in many shops. Very little space would be required, and with the proper apparatus the difficult task is rendered light and easy.

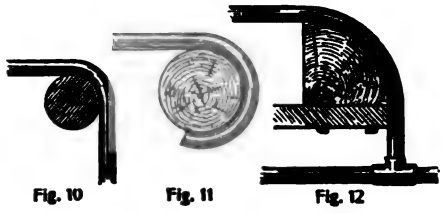
The result of trying to bend tubes or pipes with a section of steel rod is shown in Fig. 1. The tube wall is crushed in and when further doubled over is completely ruined (Fig. 2). Sometimes, where it is attempted to bend the metal back to restore the fractured place, it splits as in Fig. 3. At this point the workman probably tries to



remedy the matter by brazing on metal rings, as in Fig. 4.

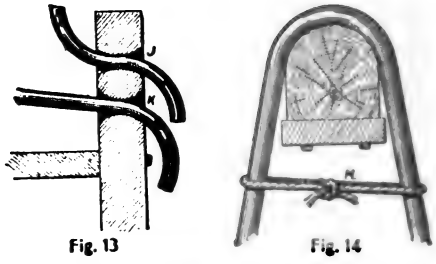
All this trouble could be avoided by melting rosin in a good-sized glue pot and then with a ladle pouring it into the hollow of the pipe or tube, as in Fig. 5. When the pipe is filled, plug the other end with a wooden stopper and you have a solid wall as at F, Fig. 6, a sectional view. Or, if preferred, or more convenient, the tube may be packed with clay, as at G. The spiral spring method is shown in Fig. 8 and a set of springs for this purpose ranging in size from ¼ in. to

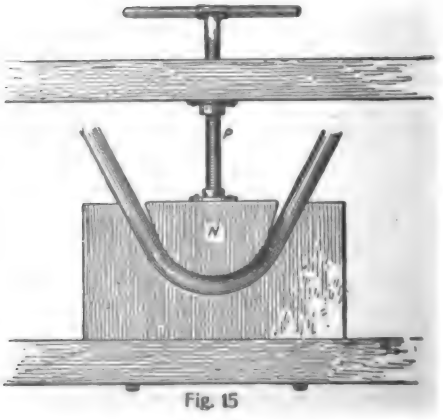




1 in. in diameter could be made from common steel wire and hung up in order in the pipe-bending corner. The method shown in Fig. 9 involves the use of a piece of wire to fit the inside of the tube. This is a good method for bending tubes of small diameter. By all these methods the pipe can be bent cold.

Pipe-bending forms are shown in Figs. 10,





11 and 12. The small round forms are metal, but others may be made of common hardwood stock. Shaft stock, 2 or 3 in. in diameter, may be used for a form like Fig. 10. Secure the shaft to a firm base of wood and effect the bending much as in bending over the point of the anvil. Hardwood is used for bends of large diameter, as in Fig. 11.

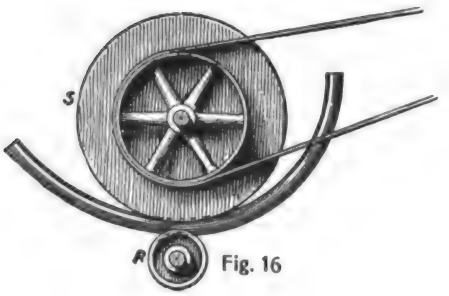


Fig. 16

The bending device shown in Fig. 13 is made of wood and is very handy. To make it select a piece of hardwood 4 in. square and 3 ft. long. Bore straight through one side, using an inch bit, and then shape the beveled places by working down the tapers of the two holes. Fasten it securely to the work bench by means of bolts. This is for light service, says the Blacksmith and Wheelwright. For heavier pipes and tubing a wooden form like Fig. 14 is useful, and may be bolted to a projection of the bench. Bend the pipe over as far as possible with the hands and then drop a loop of rope, M, over to hold it in place.

A set form bending device is shown at Fig. 15. The block for the base is cut out in the desired curve and a piece of hardwood, N, is shaped to correspond with the curve in the base and is fitted to the shaft P. The shaft can be raised and lowered, turning the crossbar as it is threaded.

Fig. 16 shows a revolving disk bending device. This consists of a small lower wheel of iron or steel having a shallow groove (just deep enough to grip the pipe) and a larger upper wheel, S, driven by a wheel for a belt as shown. Both the upper and lower wheels revolve in substantial wooden bearings on metal shafts. Pipe sleeves are used to line the bearings in which the shafts turn. The curve is made by running the pipe between the grooved wheels.

A grip form for pipe-bending is shown in Fig. 17. It is made of two pieces of hardwood, jointed at T, and having a series of holes of various sizes bored for receiving the tubing to be bent. The clamping arrangement is bolted to the bench and the pipe is held firm while being bent.

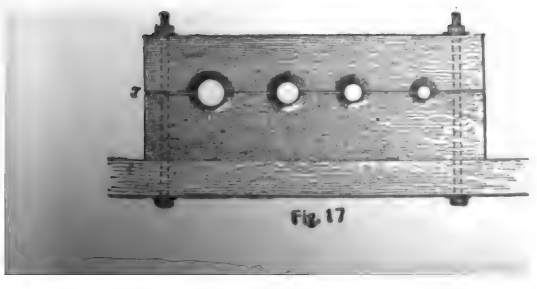
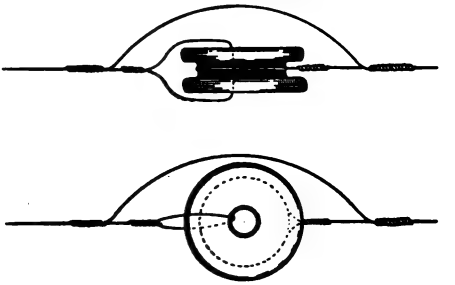


Fig. 17

TO STOP HUMMING OF TELEPHONE WIRES

The following is recommended as a positive cure for the humming of telephone wires.

Procure a porcelain spool insulator with a deep groove and place in the groove a rubber band (a piece of inner tube from a bicycle will do); then place around the rubber and in the groove the line wire, preferably insulated. Pass another piece of insulated wire through the hole in the insulator and make a connection as shown


Anti-Hum Device

in the sketch. With another piece of wire bridge around the connection so as to complete the circuit. The device is cheap and efficient.—Contributed by Walter La Homadue, Cherry Valley, N. Y.

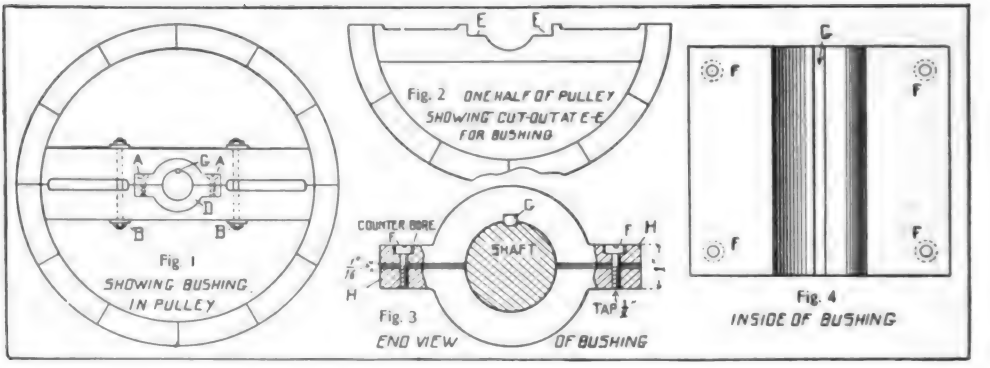
UNITED STATES STANDARD BOILER IRON THICKNESS

The following table gives the thickness of boiler iron required by the laws of the United States, for the various pressures given in each case. The Practical Engineer states these figures are for pressure equivalent to the standard for a boiler 42 in. diameter and one-quarter inch thick.

Thickness in fractions	Diameter.						
	30 inches.	36 inches.	42 inches.	48 inches.	54 inches.	60 inches.	66 inches.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
5	169.9	160.4	152.0	144.4	137.5	131.2	125.5
4⅞	158.5	149.7	141.8	134.7	128.3	122.5	117.2
4¾	147.2	139.1	131.8	125.1	119.2	113.7	108.8
4	135.9	128.3	121.6	115.5	110.0	105.0	100.0
3⅞	124.5	117.6	111.4	105.9	100.8	96.2	92.0
3½	113.2	106.9	101.3	96.2	91.7	87.5	83.0
3	101.9	96.2	91.2	82.6	82.5	78.7	75.0

SAFE BUSHING FOR A WOOD SPLIT PULLEY

Oftentimes when a large wood pulley is tightened on a small shaft, it is a hard matter to keep it from slipping, especially a new pulley, where it would only take a few minutes work to cut a keyway in the shaft with a cold chisel without taking down a section of shafting.



Make an iron bushing of forged or cast steel to fit the hole for the former wood bushing, with two projecting lugs as at H H, Fig. 3. Cut out the pulley on each side of the hole as at E E, Fig. 2, to make a place into which the bushing will fit.

Drill four holes in the bushing, two at each side as at F F, Fig. 4, and tap ½ in. or larger in one-half of the bushing for blind cap screws.

Bolt the two halves of the bushing together and bore them out the size of the shaft. Put pasteboard between the halves before boring. Then keyseat and put on shaft over key at G, Fig. 3.

This bushing can be made from a pattern, cast iron or steel, and as long as the web of the pulley it is used with. This is a good method where a large pulley has to transmit power to a heavy load.

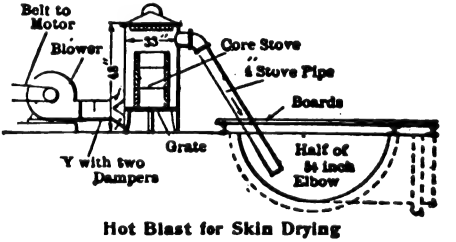
Fig. 1 shows bushing in pulley at D, keyed on to shaft and bolts, B, B, all set.—Contributed by F. M. D., Rocks Falls, Ill.

Use a very soft iron for brass molds, as the best iron for the purpose is one that cuts easily. Common machinery iron is not at all adapted to the purpose, as it soon develops cracks on the surface of the mold casting.

HOT BLAST STOVE FOR SKIN-DRYING MOLD

A hot-blast stove used for skin-drying molds for large pipe castings is described by a correspondent of the American Machinist, who recommends it on the grounds of cheapness and high efficiency.

An ordinary coke stove (four gray-iron rings set up on a circular grate with four legs) is surrounded by a cylinder of No. 16 steel, 33 in. diameter, 48 in. high and fitted with a cover. The cylinder fits the grate casting. The stove has a Y inlet, each branch fitted with a butterfly damper, and at the top one outlet. Air is supplied to the heater by a small blower mounted on a plank and driven by a motor. The hot air is driven into the mold, as shown in the sketch. The combustion of the coke is controlled by means of the damper in the inlet under the grate. The half-mold shown in the sketch is covered with boards, sacking and sheet iron. The temperature in the



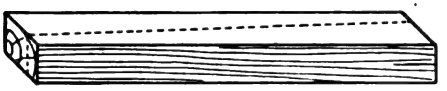
Hot Blast for Skin Drying

mold will register 300 degrees F., and a bushel of coke will last ten hours, continuous run.

Many of the parts required for this stove will be found lying unused about the shop.

FENCE POSTS BOTTOM UPWARDS

Many years ago while engaged in running a saw mill in eastern Connecticut I had a lot of fence posts to saw from small chestnut logs. The posts were to be sawed tapering and to economize in lumber the logs were



Post Economy

first sawed square and then split diagonally like the accompanying diagram. Of course they were to be set in the ground large end down, which would bring one-half of them bottom up in regard to the position in which they grew.

I remembered hearing an old farmer say that posts set that way would outlast those set "right end up" and I determined to improve the opportunity at hand to test the matter. So I marked all the inverted ones and as the fence was to be built in the neighborhood I watched the result.

Examining the fence about nine years after it was built convinced me, as the inverted ones were practically sound while the others showed very much more decay.—Contributed by Andrew Whiton, Hartford, Conn.

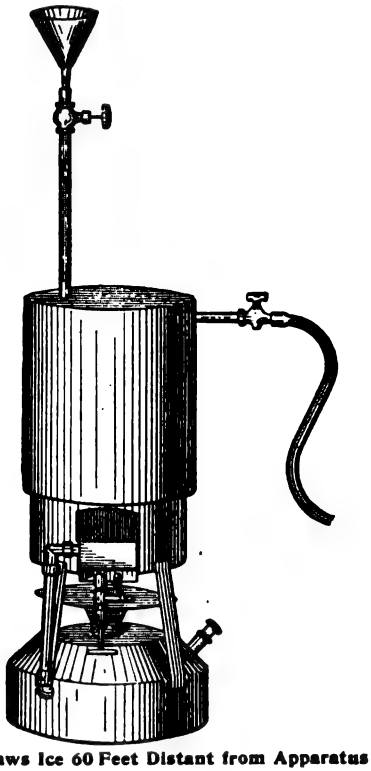
LINOLEUM COVERS FOR WORK BENCHES

Heavy linoleum makes a fine covering for the tops of work benches, says a correspondent of the American Machinist. The bench may have a pine top instead of one of hardwood, but should be constructed quite as usual. Use tongued and grooved pieces for the top and fill all holes with plaster of paris. The linoleum costs about $1 per yard.

To fasten it to the bench glue the edge next the workman for about 3 in. and secure over night. Then trim the edge flush with the bench and hold the other edges in place with wooden strips arranged so the linoleum will move under them as the top of the bench shrinks. The linoleum is so stiff it will always lie flat and it will last for years. Two benches covered with it have been in use five years and though the covers are marred some, they are still in good order for work.

APPARATUS FOR THAWING OUT PUMPS

For thawing out frozen pumps, the handy portable apparatus shown in the illustration was contrived by a correspondent of the Metal Worker. It consists of an ordinary gas firepot with a galvanized iron can of suitable size, the top of which is provided with two outlets, made from small pieces of galvanized iron pipe soldered securely in place. One outlet stands vertically from the



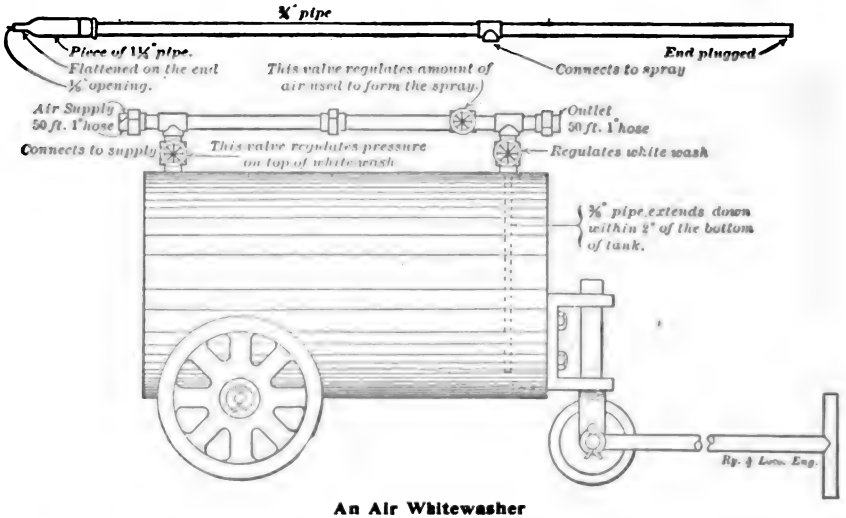
Thaws Ice 60 Feet Distant from Apparatus

top of the can and has a small globe valve on it, just above a T arranged to receive a safety valve. Above the globe valve is soldered a small funnel.

The other outlet is connected from the side of the boiler into a small valve, or petcock, which receives a rubber hose. To use the apparatus the boiler is heated until sufficient steam pressure is generated, when the hose is inserted in the pump, finds its way readily to the ice and the steam speedily thaws it. Ice 60 ft. distance from the boiler can be thawed in this way. Most shops contain all the materials required for such an apparatus.

AIR WHITEWASHER

A whitewasher operated by compressed air, says a correspondent of Locomotive Engineering, accomplishes in two hours an amount of work that would keep one man busy a month. The construction of the machine is fully explained in the illustration.



An Air Whitewasher

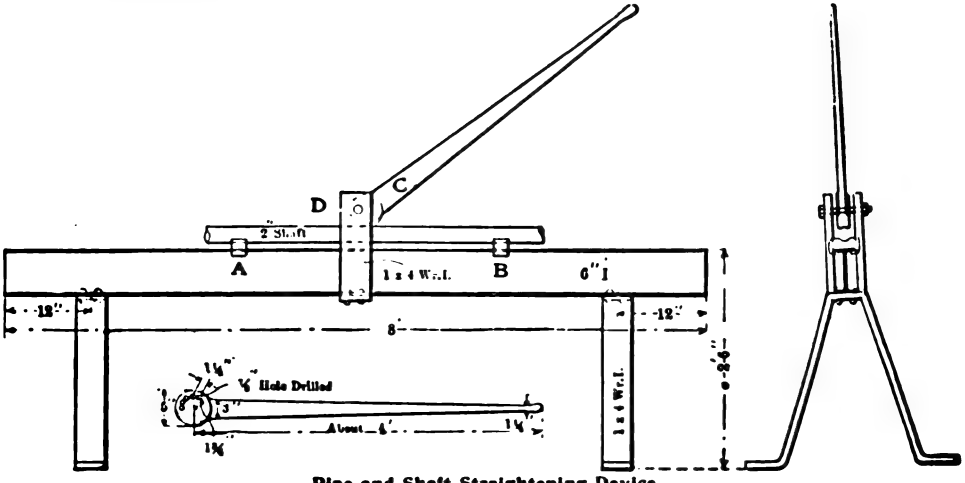
MACHINE FOR STRAIGHTENING PIPE AND SHAFTING

The press shown in the illustration can be used for straightening pipe and shafting or for bending pipe. The device was contrived by a correspondent of the American Machinist and in construction is very simple.

Blocks A and B are forgings fitted over the top of a 6-in. I-beam, so that they are free to move the length of the beam, which is 8 ft. long. C is a lever with the lower end enlarged and the edge ground some. One end of the lever acts as a center and can have any number of holes drilled in it. It is very easy to straighten 2-in. pipe in such a press.

Rubbing with a piece of chamois leather or cotton flannel moistened with alcohol will readily reduce a too strong high light in a negative.

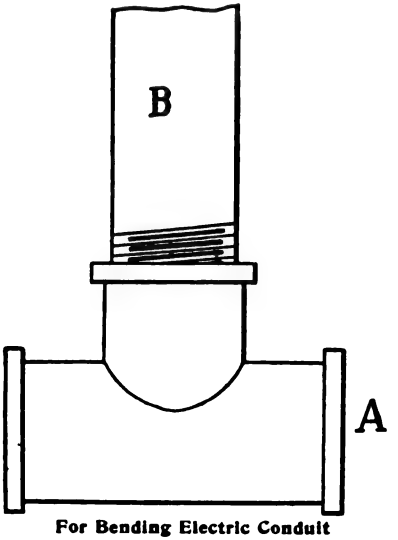
Shop Notes for 1905; 200 pages; 385 illustrations; price, 50 cents.



Pipe and Shaft Straightening Device

DEVICE FOR BENDING ELECTRIC CONDUIT

A device for bending the smaller sizes of electric conduit is made by screwing a piece of pipe into a tee, A. To use slip the tee over the conduit till it reaches the point where the bend is to be made. Then stand



For Bending Electric Conduit

on the conduit and pull or push handle B. Any curve can be bent in this way and different sized tees may be used for different sizes of conduits.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.

HINTS ON GLUE

It requires more water to dissolve good glue than to dissolve poor glue. The best glue, says the Wood-Worker, will require from one-half to more than double the water required for poor glue.

Good glue breaks hard and tough, with a splintered edge.

Cleanse the glue kettle often.

Frozen glue is so porous that it can be made up at once.

IMPROVING A WASHER

A thick washer can be made out of an old nut or a thinner one can be made of a piece of sheet iron or a metal button, says Gas Power. A very simple and easily made washer is a ring made from a piece of wire of suitable thickness.

A GOOD FLUID PASTE

Dissolve 10 lb. gum arabic and 2 lb. sugar in the amount of water required. Then add 1¾ oz. nitric acid and heat to the boiling point. This liquid paste will not mould and dries to a transparent layer on the paper. The Western Painter says it is well adapted for the flaps of envelopes, fine bookbinders' work, etc.

TO FIND CENTER OF SHAFT WITHOUT CENTER PUNCH

Procure a block of wood 1 in. thick and with an auger bit bore a hole in the block until just the point of the bit shows through

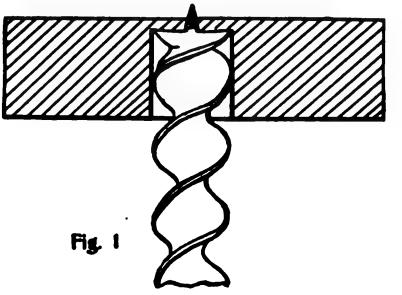


Fig. 1

the block as in Fig. 1. Then place block over the end of the shaft, Fig. 2, and with a sharp pointed punch and a hammer the center can

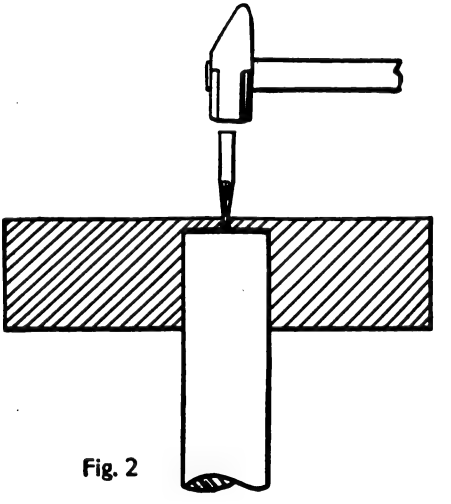
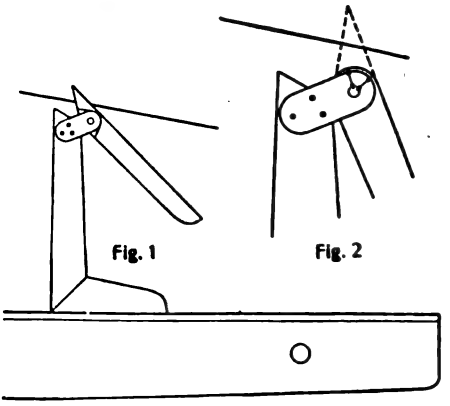


Fig. 2

be marked slightly. Then use a drill and drill out. The hole in the block must be the same size as the shaft.—Contributed by Eli Tolliver.

IMPROVING THE CLINOGRAPH

The clinograph is a set square used by draughtsmen for drawing inclined lines, section lines, and for shading, etc. It comprises two parts, one having two rectangular edges and another part, termed the "blade," which



Two Forms of Clinograph

is hinged to the first part. In using the appliance, one of the fixed edges is placed against the T-square and the blade adjusted to any position desired, where it is held by friction.

The instrument is slid along the T-square to any part of the drawing paper, for drawing parallel lines, says Technics, London, or for perpendicular lines, it is set and then turned with its other edge against the T-square. The illustration shows two forms of the clinograph. Fig. 1 shows a form in common usage, but the form shown at Fig. 2 is an improvement upon the first form, in which the edge can only be brought to coincide with a line by trial. In the second form the concentric portion is brought to the line and the blade swung around to coincide with the line without a trial. The alteration can be made with a pocket knife.

Has your boy a copy of Mechanics for Young America? Paper covers, 25 cents.

A GOOD STAPLE PULLER

A good staple puller that will do the work quickly and easily and leave the staples in better condition than such tools do ordi-

Fig. 1.

narily, is made of ½x½-in. steel; a correspondent of the Blacksmith and Wheelwright says he uses old harrow teeth for the purpose. The steel is first shaped as

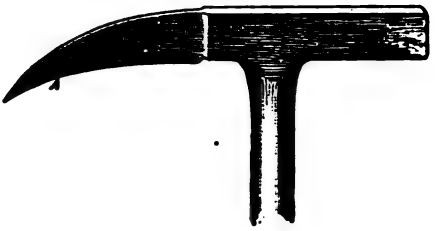


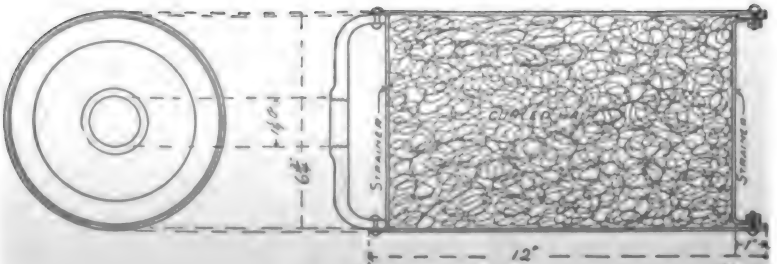
Fig. 2.

in Fig. 1, a bottom view, and then as in Fig. 2. The edges at A, Fig. 2, are rounded a little so they will not injure the wire. The handle may be of any length desired.

A sewing-machine that will sew directly from two reels of thread instead of using a spool of thread and a shuttle is the reputed invention of an Irishman. The machine is of simple mechanism and can be manufactured and sold at a greatly reduced price. Experts say the machine will revolutionize the sewing-machine trade of the world.

STRAINER FOR AIR PUMP

A strainer for the air cylinder of an air pump consists of curled hair held between two strainers. The device is screwed on the air cylinder and strains the dirt out of the air. A correspondent of Locomotive Engineering has used this strainer with excellent results.



Air Pump Strainer

DRIVING STAKES BY COMPRESSED AIR

A unique stake-driver and one that saves considerable hand labor is used by the Barnum and Bailey circus, says Air-Power. The apparatus consists of a rock drill suspended between two vertical guides. The two side rods of the drill are continued below the lower head and support a round anvil. This anvil rests on the head of the stake to be driven and holds it firmly by means of spring clasps. As the stake is driven into the ground the driver is lowered by means of a cylindrical hoist and follows the stake downward until it is driven in securely.

CROW BRIDGES FOR DRILLING HOLES IN DIFFICULT PLACES

For drilling holes in difficult places, the crow bridge can be used to advantage many times.

Fig. 1 shows how a crow or brace may be used. It is made of 1x1½ in. iron. The arms may be extended if required by two extension pieces, B.

When it is possible to pass a chain around the casting, cylinder, or material to be drilled, the crow may be used on work as in Fig. 2. Two holes are drilled at C C and the end link of a small chain passed through one, and a small bolt D pushed through the link to hold the chain. The chain is then passed around the work and pulled through the other hole until taut and fastened there with a small bolt.

The beauty of these crows, says a correspondent of the Engineer's Review, is that it is only necessary for an engineer to get hold of the bar iron. He can then shove it into his furnace fire, get a red heat on it and bend it as required. A couple of holes drilled completes the job and he has two handy tools.

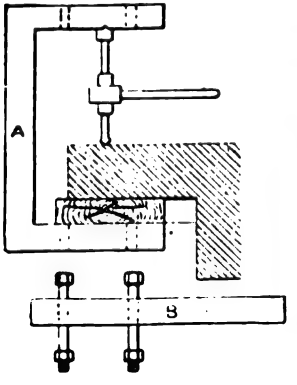


Fig. 1

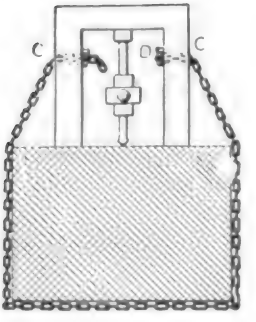
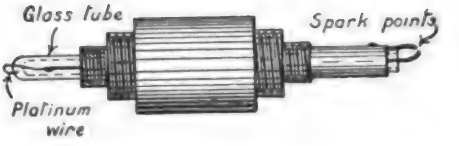


Fig. 2

HOW TO MAKE A SPARK PLUG FOR A SMALL GAS ENGINE

For a small gas engine (⅛ h. p.) a spark plug may be made and substituted for the ignition tube. A correspondent of the Model Engineer, London, tells how to make such a spark plug.

FIG. 1.—SPARK PLUG.



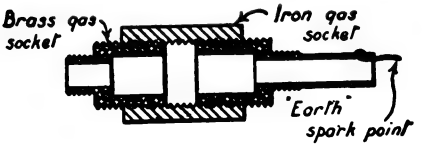


FIG. 2.—SECTION.

FIG. 3.—BRASS SOCKET

Make a stuffing-box of three ordinary gas sockets, packing them with asbestos string moistened with paint. Insulate the "live" wire by a glass tube (Fig. 1), passing it through the stuffing-box. Connect the outer end of the "live" wire to a short piece of thin platinum wire and then hermetically seal this wire through the end of the glass tube. Pack the wire tightly in the tube with paint-moistened asbestos.

Rivet the "earth" spark point through a hole in the brass tube, which hole may be made by filing or turning off the lower part of the thread of the bottom brass gas socket (Fig. 3). Then bake the whole plug in the oven.

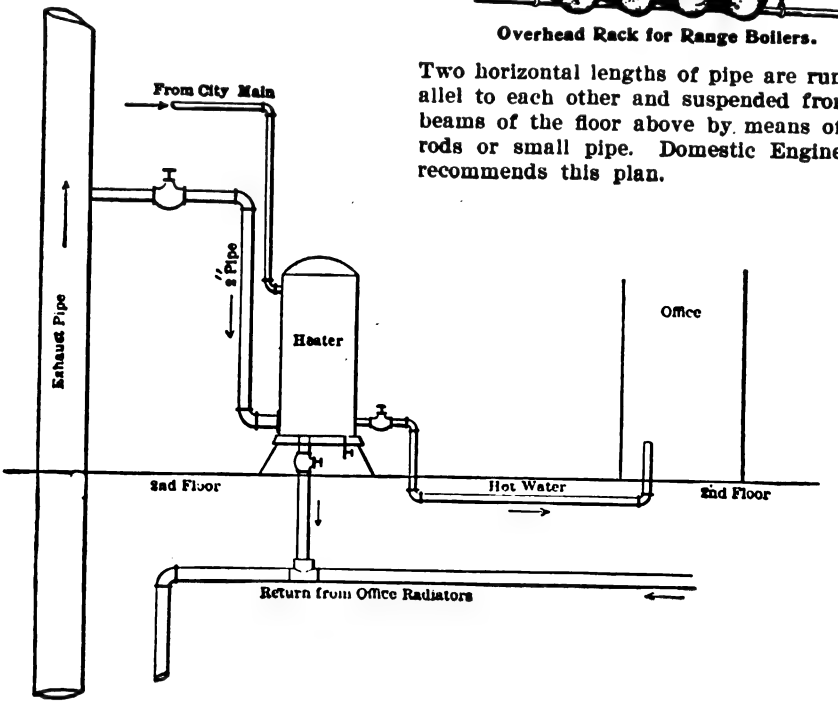
The spark plug screws into the ⅜-in. hole previously occupied by the ignition tube.

The mechanic with a just appreciation of economics will send $10 for a "Pop" life subscription.

HOT WATER FOR OFFICE USE

A system for heating water for office use was planned by a correspondent of Power. An old feed-water heater of the enclosed type, that had become too small for its original purpose was moved from the engine room to the second floor of the building and placed near the main exhaust pipe of the engine.

A 2-in. hole was tapped in the exhaust pipe and a pipe run from this hole to the heater. The outlet of the heater was connected to the return pipe of the radiators from the office. The cold water entered the heater from the city main at the top and the delivery was piped under the floor to the office, as shown.



For Providing Hot Water for Office Use.

HOW TO REVIVE BURNT STEEL

A burnt tool may be revived so that it can be used in nearly every case, and if not the experiment has cost nothing, writes a correspondent of the Model Engineer.

Harden the tool in the usual way three times and then temper to the desired degree. This method can be used on hand tools, drills and small chisels with advantage.

STORING RANGE BOILERS

Range boilers not only take up considerable space in the shop, but are apt to suffer damage by being tipped over. The sketch shows a convenient means of storing them.

Overhead Rack for Range Boilers.

Two horizontal lengths of pipe are run parallel to each other and suspended from the beams of the floor above by means of iron rods or small pipe. Domestic Engineering recommends this plan.

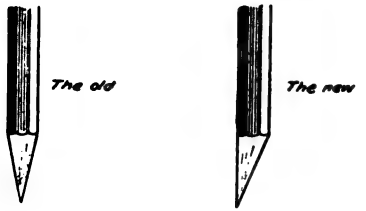
TO APPLY ASBESTOS NEATLY

In applying asbestos about the steam plant a neat, quick method pays. The following is given by Machinery as such:

Make the asbestos plastic by mixing it thoroughly with water. Apply the first coat rough and about ½ in. thick, using a pointed trowel. Let dry and apply a second coat ¾ in. thick, and straighten down with a large trowel. Wind the second coat with No. 16 annealed wire, having the coils about 3 in. apart at all points. In case of a flat surface, bind it with horizontal wiring. Apply a third coat of asbestos to cover the wire and make a smooth surface. A 100-lb. bag of the material will cover about 40 sq. ft. of surface in this way.

SHARPENING DIGGING BARS

The method of sharpening the digging bars used for digging post holes, commonly is to give the point a bevel like a chopping or cold



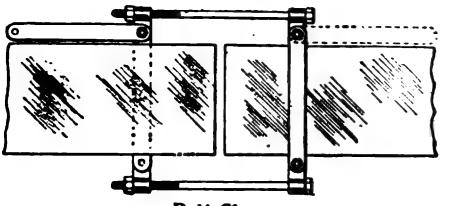
Two Ways of Sharpening Digging Tools

chisel. In hard or gravelly soil this shaped tool is apt to make a funnel-shaped hole and it is difficult to get the workmen to do any better with it.

A correspondent of the American Telephone Journal says that if the bar is beveled all on one side and the other side is left straight like a wood chisel this difficulty of funneled holes will be greatly overcome and that the men can make better time using this shaped tool.

HANDY BELT CLAMP

This simple and convenient clamp is made of ½-in. by 2-in. iron and is intended for belts not larger than 12 in. wide and ⅜ in. thick. The dimensions of the clamp can be increased in proportion for larger belts, however, says the Engineer's Review. The side



Belt Clamp

bolts of the clamp are of ⅞-in. stock, 24 in. long and the bolts clamping the crosspieces are of ½-in. stock, 2½ in. long with square heads.

In taking the clamp off, first slacken up on the long bolts, then on the small bolts and take two of them out.

To make new tin roofs hold paint well, give them a good rubbing with No. 1 sandpaper before applying the paint.

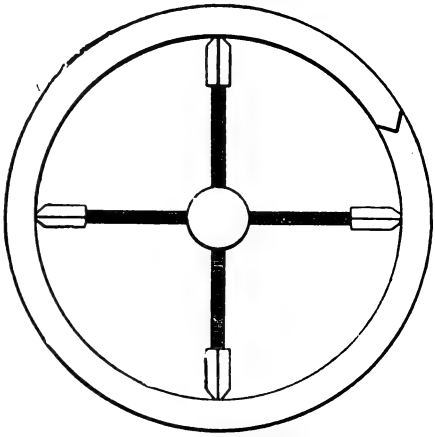
When paint is "tacky" try rubbing it with a cloth wet with ammonia.

SPRINGING PACKING RINGS OVER PISTON

In putting a snap ring on the piston of the high pressure cylinder of a tandem compound engine a correspondent of the Engineer's Review made use of the following kink. This job is very difficult for as soon as the ring is started on one side it slips off the other, and yet, for fear of breaking the ring the engineer must proceed cautiously.

Four pieces of square iron were cut off in 3-in. lengths and threaded to a depth of 2½ in. One end of each block was made tapering, coming down to a sharp point to prevent slipping of the ring surface.

Four bolts were threaded and screwed into these four blocks, which were placed in position as shown in the illustration. To put the



Method of Springing Packing Ring Over Piston

ring on the piston, the bolts and blocks were put in place and tightened up so as to spring the ring evenly until it was large enough to slip on over the piston.

MIXING CONCRETE

A concrete mixture of the following proportions is recommended by engineers.

To 1 bbl. Portland cement add 3 bbl. clean, sharp sand. Mix the two intimately, either manually or by a mechanical mixer. Add enough water to bring it to the proper consistency, the amount required being judged by one of experience in the work. Add 5 bbl. of broken stone and intermix the whole, which is then ready for use. This is known as a "1-3-5 mixture." The nature of the ingredients and the purpose for which the concrete is intended make the proportions variable, however.

HOW TO MAKE AN ELECTRIC ILLUMINATED FOUNTAIN

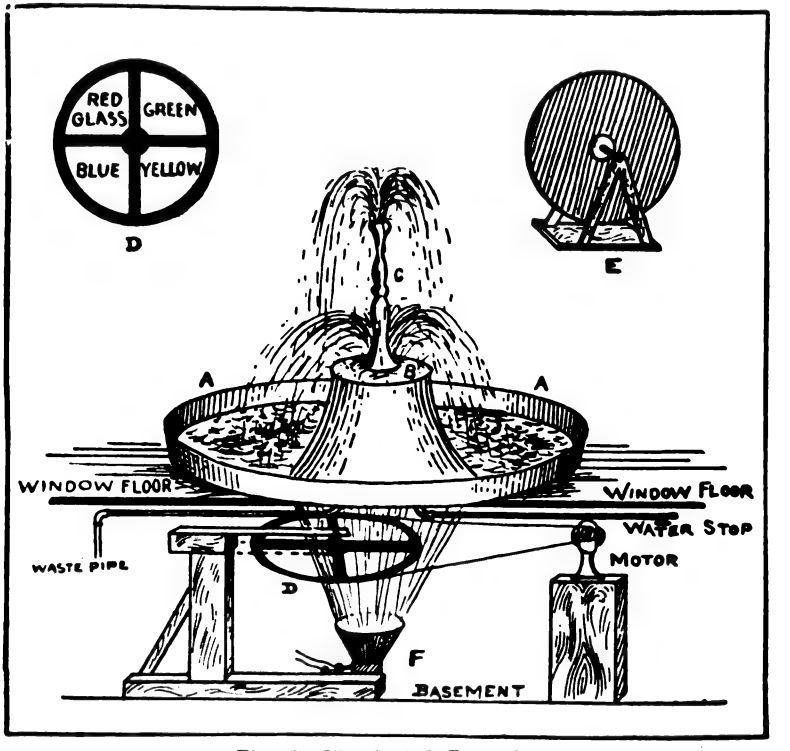
One of the prettiest and most attractive displays for a show window is an electric illuminated fountain. The Keystone tells how such a fountain may be constructed.

Have a tinsmith make the center bowl A of tin, of any size desired, according to the size of your window. This center bowl should be shaped like a large cake tin, hollow in the center. Cut a hole in the center of the window floor and place the tin bowl over it. Put a large rubber band around the center tin cone. Secure a circular glass shelf, B, having a hole in the center, and rest it upon the cone.

Have the tinsmith make a fancy stem, C, enamel it white, punch fine holes in it at the top and bottom and solder it to the water pipe, which passes through the hole in the center of the glass shelf and which is attached to the main pipe in the basement. Put a rubber washer on the glass shelf to make it watertight. The waterflow is regulated by water stop and the surplus is carried off through the waste pipe.

Make a skeleton pulley, D, with a piece of colored glass in each of its openings. Use red, green, yellow and blue glass and fasten it in position with tacks. Arrange this pulley so that half of it is in the center of the fountain.

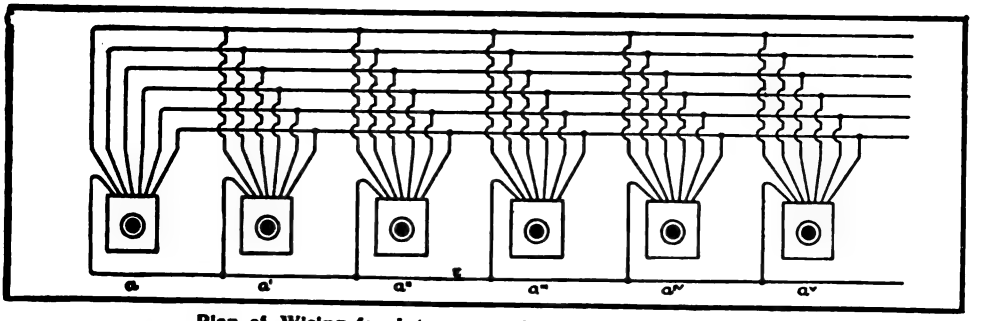
Place a strong electric light with a reflector in the position shown at F, so that it sends its rays upward through the colored glass and through the center cone on the water. The effect will be most beautiful. The changing of the colors can be reduced to speed by means of the reducer E. In the lower bowl lay three electric bulbs colored green, with wires made waterproof, well insulated and enameled. Pond lilies and gold fish may be added and a magnificent display created.



Electric Illuminated Fountain

A good cement for metal joints consists of ground white lead worked up with enough powdered red lead to bring it to the consistency of putty. Then add boiled linseed oil.

Our premium list is worthy of your attention. Write for it.



Plan of Wiring for Intercommunicating Telephone System

INSTALLING INTERCOMMUNICATING TELEPHONES---PLAN FOR SIX TELEPHONES

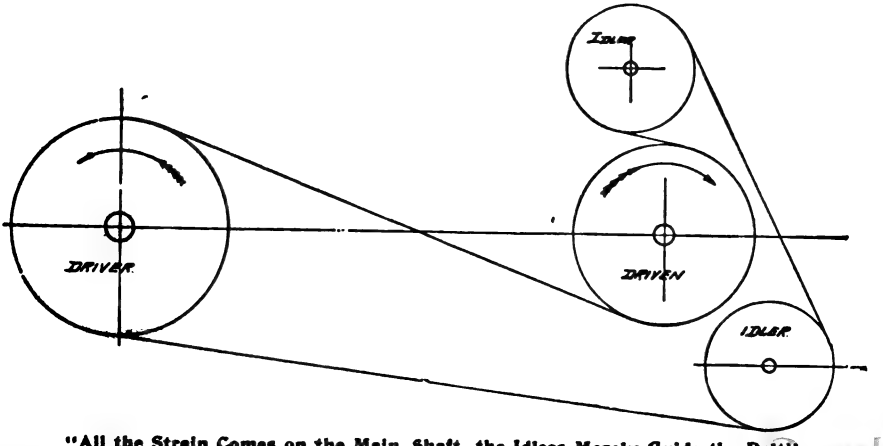
The approved plan of wiring for intercommunicating systems is shown in the accompanying diagram, which we reproduce by courtesy of the American Telephone Journal. The diagram shows six telephones, a, a', a", etc., to each of which six wires are run. The circuits are completed from the other terminals of each telephone, through the common return wire. The diameter of this return wire should equal the sum of the diameters of the separate wires, where the lines average over 1,000 ft. in length.

Switch board cable should not be used on the intercommunicating system because of creating mutual induction between two circuits, being twisted in pairs. Ordinary house wire, No. 19 B. & S. gauge, with a rubber insulation and a covering to match the woodwork along which it is run is recommended as best. Each separate wire should have a distinct color or combination.

ANOTHER METHOD OF REVERSING COUNTERSHAFT WITHOUT CROSSING BELT

Commenting on the article on reversing a countershaft without crossing the belt by means of two idlers, which appeared in the July Popular Mechanics, W. B. Burrows, of Minneapolis, Minn., says:

"The use of the two idlers for this purpose is all right, but according to my way of figuring they are not used correctly for the reason that the strain of the full load is brought on one of the idlers. I herewith submit a sketch of what I consider the better method for this kind of a drive, as it brings all the strain on the main shafts (where it belongs), leaving the idlers to simply guide the belt and carry the weight of the slack side, as well as allowing lighter shafts and bearings to be used for the idlers. I have used both ways, the latter up to 600 r. p. m., carrying a heavy, uneven load, and find that it gives a great deal better satisfaction all around."



"All the Strain Comes on the Main Shaft, the Idlers Merely Guide the Belt"

WIRELESS TELEGRAPHY IN EVERY DAY USE.

It is hard for the layman to realize that in a comparatively short time wireless telegraphy has passed from the merely experimental stage to the point where it is giving constant and practical service. Already it has figured importantly in a great conflict and has become an adjunct of every great navy.

Since June, 1902, the Marconi system has been an important part of the equipment of the Belgium mail packets plying between Dover and Ostend. Experiments were begun on these packets in 1900. A coast station having a mast 151 feet high was established at La Panne and the floating station was established on the "Princess Clementine" which had a mast 98 feet high. The transmitter system of each station consisted of an oscillator having one terminal connected to the earth and the other to an antenna. In October, 1901, the tests resulted satisfactorily. Then the government began installing the system.

A new station was established at Nieuport Bains, the building being of brick with the terminal of the antenna carried to it. The mast is in its immediate neighborhood and the station has the ordinary telegraphic communication with the interior of the country. Two government employes are on duty at this station during the day; during the night, one employe of the wireless telegraph company. Each vessel sends an average of three telegrams during a night voyage, and during day trips each vessel receives one message. In the messages, the signal of the message, a number, is first given, then the number of words, the nature of the telegram (service, private, or government), the name of the boat and the text which is usually of the following character: "Left Dover at 11:03 P. M.; thirty-two passengers; 220 postal sacks; clear; wind E. S. E."; signature. The commander and his officers have charge of the manipulation. The steamer stations receive no outside messages nor interfere with any apparatus having a different pitch, the government contracts calling for this syntonizing. Signals are exchanged best on damp moonlight nights.

The transmitting station, says the Electrical Review, consists of a storage battery of eight cells which supply the Ruhmkorff coil with eight amperes at sixteen volts, equivalent to 160 watts. The coil transforms the current to 40,000 volts. The storage battery is charged by the dynamo which lights the station. The antenna consists of three wires soldered together at the extremities. The total length of wire is 180 feet. The height varies on the packets from 49 feet to 89 feet, according to the height of mast.

The receiving apparatus consists of a receiver complete: relay, decoherer, coherer, jigger, box of batteries, next a Morse register and a signal bell. Each station is provided also with reserve apparatus, a storage battery, a coil complete, three Leyden jars, a receiver complete, and twelve batteries.

Service in some of the packets is now public, the charge being 10 cents for fifteen words. Wind, rain, snow, cold or heat, the service remains as efficient—and at times has been of great importance. For instance a packet once encountered a Norwegian bark with a broken rudder. The condition of the bark was reported by wireless telegraphy and a tug despatched to its aid. Once a thief was believed to have escaped by way of a packet. Upon being informed while at sea the captain instituted a search for him and made sure he was not on board.

There have been other instances—broken propellers, light buoys going out, danger of losing routes in heavy fogs, etc., all of which have been safely met by this wonderful new agency, which means more to the navigator than to any one else.

DRAINS AMONG TREES.

Tile should not be run among trees, especially willow or cottonwood trees, says Brick. The illustration shows the probable effect on the drain, if this advice is not heeded. The small fibrous roots will soon choke the tiles and entirely shut off the water they are intended to carry, so that it will be necessary to dig them out and clean them. In such case, do not replace them, but run in the same size sewer pipe, cementing the joints to prevent a recurrence of the trouble.

What May Happen to Tile Run Among Trees

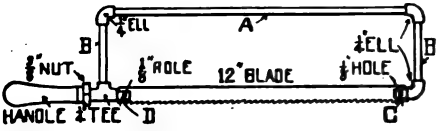
All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

A PIPE HACKSAW FRAME

To make this frame, three ¼-in. ells, two pieces of ¼-in. pipe, 3 in. long (B B), one piece of ¼-in. pipe, 15 in. long (A), and one



Pipe Hacksaw Frame

¼-in. tee will be required. C is a piece of bolt iron, pipe-threaded and screwed into the ell; D is a piece of the same metal, 4 in. long, which is bolt-threaded and passed through the reamed tee with about 4 in. of thread on the handle side of which is a nut by which the tension of the blade may be adjusted. Parts C and D both have slits sawed in them parallel with the blade, into which the blades are fastened by means of pins passing through holes drilled for the purpose. Fittings without bosses on them make a neater appearance, and all brass pipe for the frame looks better, also.—Contributed by Apprentice.

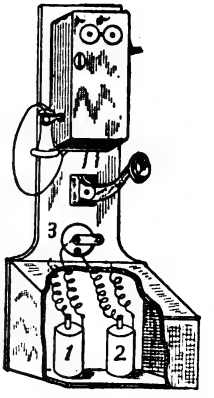
HOME-MADE WATER HEATER

A water heater to have steam and drip connection hitched into steam heating system, the same as a radiator, water entering lower tee and being discharged from the upper tee, is shown in the illustration.

The heater may be used either vertical or horizontal, though it should be pitched toward the drip end, and may be used with or without tank. It consists of outer pipe in the end make the shell watertight where the steam pipe enters with a long thread at both ends.

A 1½-in. outside pipe with tees 1½ in. x ½ in. or equivalent; with bushings 1½ in. x ¾ in. for the end and bushings ¾ in. x ½ in. for connecting and making watertight joints with ½ in. steam pipe at the ends, will heat a volume of water 6 or 8 ft. long.—Contributed by W. J. Barber, North Adams, Mass.

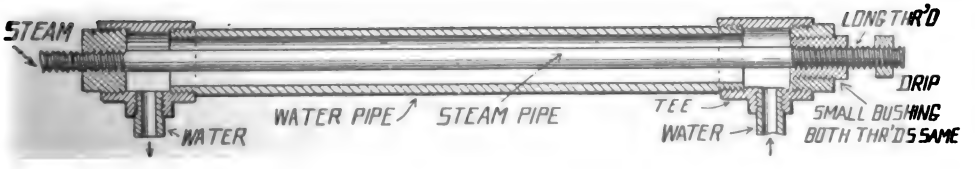
BATTERY ECONOMIZER FOR TELEPHONES



By the use of a switch (3) placed on the telephone box or on the wall and wired up with the batteries (1 and 2) as shown in the diagram, a great deal of wear on the batteries can be saved and they will last a long while. — Contributed by Geo. R. Bowers, Shelbyville, Mo.

VARNISH PRECEPTS

One coat of varnish never cracks.
Two coats of varnish seldom crack.
Three coats of varnish often crack.
Four coats of varnish always crack.
—Master Painter.



Home-Made Water Heater

or shell, through the center of which passes smaller pipe for steam, the water being around this smaller pipe; heads or bushings

Shop Notes for 1905 contains 200 pages; 385 illustrations. Price, 50 cents. Write for a copy to-day.

DRAWING FIVE-POINTED STARS

One of the easiest methods of making a five-pointed star by the use of the steel square is to describe a circle of a given diameter, then divide up the circumference by indicating chords equal to seven-twelfths of the diameter. The five points where the chords intersect the circumference will be the points of the star, says the Metal Worker.

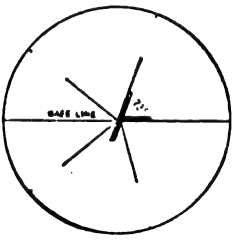


Fig. 1.

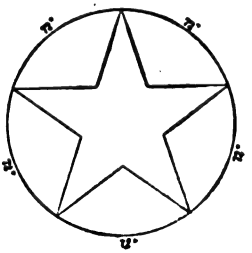
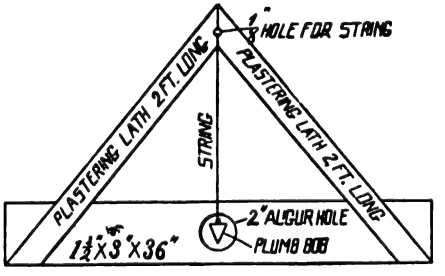


Fig. 2.

Another good way is to divide 360 by the number of points the star is to have, which will give the distance between points in degrees. Then get the angle on the bevel square with the protractor, and using any diameter as the base line, the points may soon be obtained. This operation is illustrated in Fig. 1, while Fig. 2 shows the star with points joined.

HOME-MADE LEVEL

A home-made level which suffices for all ordinary purposes is shown in the diagram. The level is made of a 1½ in. x 3 in. x 36 in. piece of wood, two plastering laths,



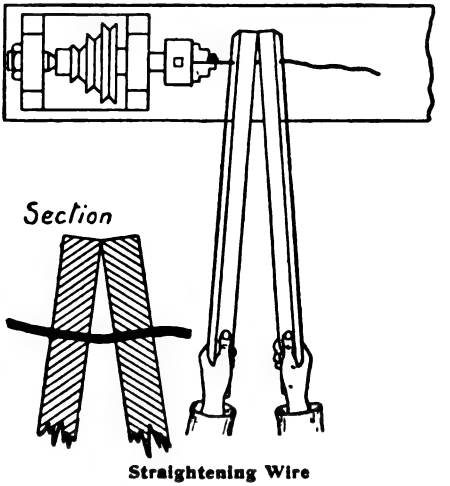
Home-Made Level

2 ft. long, a string and a plumb bob. The illustration explains the construction. The lathes may be nailed to the bottom piece with shingle nails.—Contributed by Jas. Morton, Jr., Dunn, Tenn.

STRAIGHTENING WIRE IN THE LATHE

Short lengths of thick wire are very hard to straighten with the mallet, but the work can be done in the lathe, quickly and easily, says the Model Engineer, London.

Grip the wire in the chuck, and roughly straighten it with the hand, so that it clears the bed. Now get two pieces of hardwood about 1 ft. by 2 in. by ½ in., and bore a hole in each about 2 in. from one end to fit the wire. Slip them on the wire close up to chuck, and start the lathe. Grip the pieces of wood in the position shown in the sketch, keeping the ends farthest away pressed close together and twisting the pieces of wood in opposite directions. Move slowly along the wire, keeping in the same position. If necessary, repeat the operation. New holes



Straightening Wire

can be bored in the wood at a short distance from the old ones when these become too large.

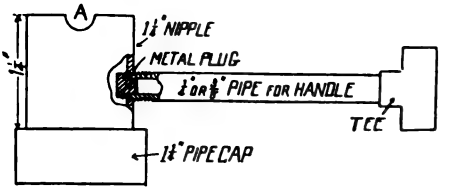
WATERPROOF ELECTRIC LIGHT SOCKETS

Electric lights so located that they are exposed to water may be made waterproof by the following described means:

Before putting the lamp into the socket fill the receptacle with a lump of soft putty, then screw the lamp in. This will force the putty into every crevice and make it absolutely tight. Unscrew the lamp again, clean the putty from the threads so that it will not stick there as it hardens, then screw up again. A correspondent of Power says this works exceedingly well.

BABBITTING LADLE MADE OF PIPE

Into a 1¼-in. pipe cap screw a 1¼ x 1¼ in. nipple, threaded on one end only. On the inside of the nipple file a mouth or lip (A) for pouring a small stream. Make a handle of 1¼-in. or ⅜-in. pipe of whatever length is

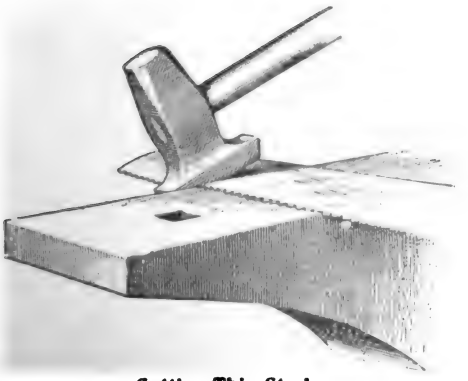


Babbitting Ladle

most convenient for your use. Screw the handle into the nipple about ¼ in. to brace it and plug it at that end with a pipe plug, or an old bolt threaded in. On the other end of the handle screw a tee, making it convenient to hold. Have all the threads neat and tight, so the ladle will not be unsightly.—Contributed by Apprentice.

TO CUT THIN STEEL WITHOUT TEMPERING

A simple method of cutting a thin piece of steel as from a saw blade, without drawing the temper, is shown in the illustration.



Cutting Thin Steel

A correspondent of the Blacksmith and Wheelwright recommends this method.

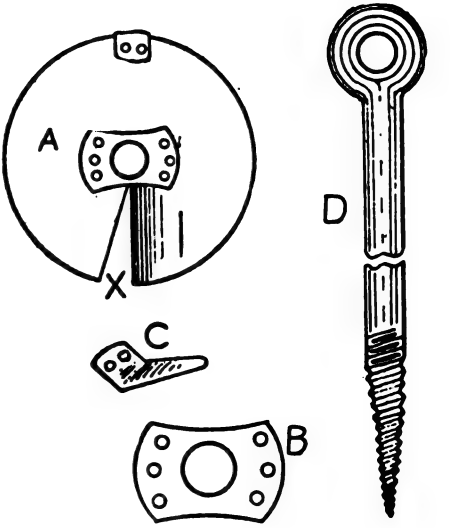
CLEANING SMOKED CEILINGS

A smoke-blackened ceiling may be cleaned by coating with a mixture of starch and water, allowing this to dry, and then brushing off lightly with a soft brush.

HOME-MADE POST AUGER

Any circular disk that is wide enough and not too thick—as, for instance, the broken blade of a disk harrow or a circular saw blade—may be used for the auger blade. Center punch the plate, mark the size required with a compass and cut in circular shape.

At the center of the disk punch or drill a ¾-in. hole, then split the disk from the center to the outer edge and cut out a small strip as at X in the sketch, so as to leave a better opening, says the American Blacksmith. Sharpen both sides of this split and turn one down and the other slightly upward. Forge a piece like B and rivet it on the blade as at A. Forge a lip, C, from a



Home-Made Post Auger

piece of spring steel and rivet it to the blade on the edge opposite the split part. This lip is intended to cut the soil on the outside, while at the split the cutting is directly down into the soil. The whole blade should be concaved on the outside edges—turned upwards.

Make the stem D, of ¾-in. round iron, 4 ft. in length, with an eye for a cross handle and with its point extending 6 in. below the blade and twisted like a twist drill. Cut a thread on the stem and screw into plate B.

This auger is particularly useful in boring holes in stiff clay soil. It makes a clean hole and can be used without water. The boring can be fast or slow, according to the downward bend given the cutting lip of the disk.

CHEMICAL FORMULA TABLE FOR PAINTERS

The painter who has some knowledge of chemistry will find it greatly to his advantage in the preparation of his colors. For those who cannot take such a course the following table compiled by the Master Painter will be found useful and worth memorizing.

Common Name	Chemical Name.	Formula
Barytes, Blanc Fixe,	Sulphate of Barium,	$BaSo_4$
Gypsum, Terra Alba, Plaster of Paris,	Sulphate of Calcium,	$CaSO_4 2H_2O$
De-Hydrated Plaster of Paris,	Sulphate of Calcium,	$CaSO_4 2H_2O$
Whiting, Lime Carbonate, Lime, Paris White, Spanish White, English White, Marble Dust,	Carbonate of Calcium,	$CaCo_3$
Sublimed Lead, "White Lead,"	Sulphate of Lead,	$PbSO_4$
White Lead, Corroded Lead,	Basic Carbonate of Lead,	$2PbCO_3PbH_2O$
Silex, Silver White, Infusorial Earth, Wood Filler, Ground Quartz,	Silica,	SiO_2
Zinc White, Zinc Oxide,	Oxide of Zinc,	ZnO
China Clay, Clay,	Hydrated Silicate of Alumina,	$2SiO_2 A1_2O2H_2O$
Litharge, Lead Oxide, Massicot,	Lead Monoxide,	PbO
Red Lead, Orange Red,	Lead Oxide,	Pb_3O_4
Chinese Vermilion and Mercury Vermilion,	Sulphide of Mercury,	HgS
Venetian Red, Indian Reds, Mineral Brown, Etc.	Oxide of Iron,	Fe_2O_3
Chrome Yellows, M and L,	Chromate of Lead,	$PbCrO_4 + PbSO_4$
Chrome Yellow, O,	Chromate of Lead,	$PbCrO_4$
Lamp and Gas Black,	Carbon,	C
Ivory, Bone, and Drop Black,	Carbon, etc.,	C
Graphite,	Graphite,	C

THAWING FROZEN GROUND WITH LIME

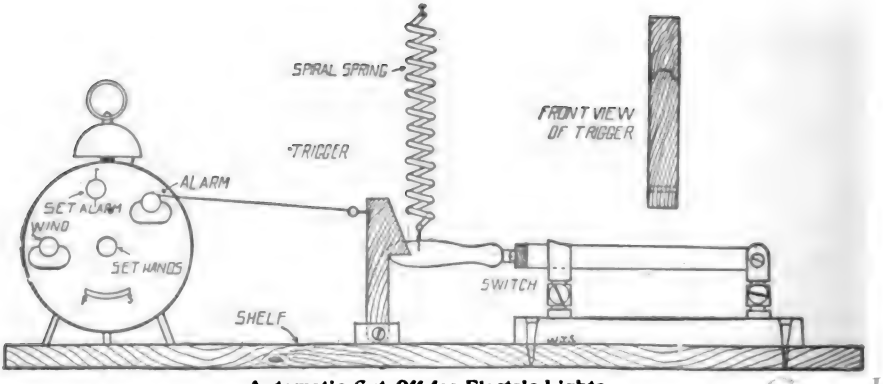
Lime may be successfully used in thawing frozen ground where excavating must be done to gain access to frozen pipes. Apply one barrel over night, covering well, for thawing out frost 1 ft. deep, in a trench 2 ft. wide and 8 ft. long. Hot water may be used with the lime to good advantage.

AUTOMATIC CUT-OFF FOR ELECTRIC LIGHTS

Fasten an alarm clock on a shelf, and about 10 in. away place a switch. Make a trigger as shown in the sketch and mount it on an axle, so it will move backward and forward. At a point on the wall above this arrangement, fasten a spiral spring at such a height that when the switch is closed and then let go, it will stretch the spring. Fasten the spring to the switch with a screw eye.

Attach a stout cord to the alarm key of the clock and run the cord to the trigger. Put a hook on the string, so that it may be hooked to the trigger, showing that the alarm is wound up. Wind and set the alarm; pull the switch down and put the handle in the trigger, then fasten the string on the trigger.

When the alarm goes off, the key will



Automatic Cut-Off for Electric Lights

wind up the string, thus pulling the trigger out and releasing the switch handle, which is pulled up by the spring and so cuts out the lights. This device is convenient for store keepers who wish to keep lights burning in show windows until a late hour.—Contributed by W. J. Slattery, Emsworth, Pennsylvania.

TO MAKE A STEAM GAUGE ALARM

A steam gauge alarm that will sound whenever the steam pressure falls to a predetermined point is described by a correspondent of the National Engineer.

Connect up an ordinary annunciator bell with the gauge, running one wire to the post of the pointer and the other to a piece of copper fastened to the face of the dial, but insulated from it. The wire to the gauge pointer will make contact with the piece of copper on the dial face whenever the steam pressure drops to the predetermined point, thus closing the circuit and ringing the bell. The alarm may be thrown out of service at any time by a switch placed in the circuit.

HOW TO PAINT IRON, ZINC AND GALVANIZED IRON

The best time for painting new iron is at the foundry as soon after casting, or being wrought or rolled, as possible, says the Master Painter. Paint it when a dry wind or warm sun will act upon it; do not paint it in the early morning or damp evening. First see that the iron is thoroughly dry and free from rust, and then coat with red lead and linseed oil, a thin coat, just enough to penetrate the pores of the iron. The first coat must dry hard. Follow up with three other coats containing red or white lead in as great proportion as possible.

To paint old iron, burn off all rust and scale, brush with turpentine or paraffin and proceed precisely as with new iron.

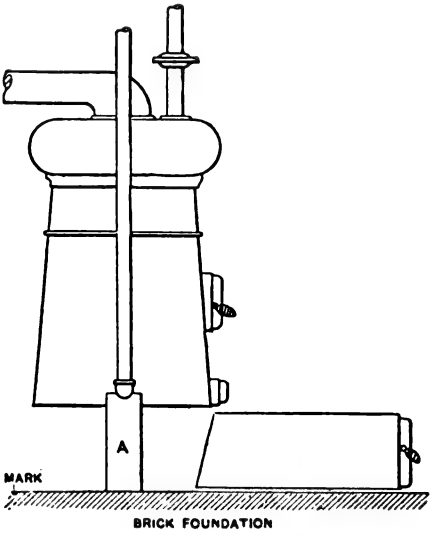
For zinc, the first coat should consist of white lead, red lead and turpentine, tempered with varnish. Wash new rolled sheet zinc with a solution of a tablespoonful of hydrochloric or nitric acid to a gallon of water, or scratch the surface with No. 2 glasspaper before painting.

Treat galvanized iron the same as zinc, but do not use the acid preparation, nor scratch. Very smooth, bright tin plate must be first dulled or scratched and the first coat should be oilless.

PUTTING A NEW BASE UNDER A BOILER

In substituting a new base under a boiler for a broken one, a correspondent of the Metal Worker tells how the job can be done quickly and without disturbing any of the connections.

Saw out two hardwood wedges and drive them under the two return pipes in position as shown at A in the sketch. These should be of proper height to lift the boiler off the base just far enough to allow the broken base and grates to be slipped out and the new base slipped in. Brace the boiler from the walls to keep it from slipping



Putting a New Base Under a Boiler

sideways, and before removing the old base score a deep mark with a cold chisel on the brick foundation, so that the new one may be put in on exactly the same spot.

HOW TO MAKE CELLULOID INCOMBUSTIBLE

Make an ether-alcohol solution of celluloid and an ether-alcohol solution of ferric perchloride, then mix the two solutions. This will give a clear, syruplike liquid, yellow in color and yielding no precipitates. Pour it into a suitable vessel and leave for spontaneous evaporation. A shell-colored substance will be produced, which after washing and drying, gives the result desired, says the Model Engineer, London.

Celluloid so treated will be pliant, transparent, uninflammable and incombustible.

SLED FOR MOVING LAWN SPRINKLER

In watering a lawn in the old-fashioned way one has to do much walking in moving the sprinkler from place to place, shutting off the water and turning it on again, and is certain to get his feet wet in the opera-

Sled for Moving Lawn Sprinkler

tion. To avoid all this trouble, make a little sled of 1x4 in. pine, 24 in. long, with ½-in. board nailed across the runners, which should be about 20 in. apart.

Then fasten the sprinkler on the sled, well toward the front, attach about 8 ft. of rope to the sled to draw it by, and arrange the hose so it will run out back of the sled to prevent its tipping over. The sprinkler can then be moved to any point on the lawn without one's running back and forth through the wet grass to turn the water on and off.—Contributed by J. S. Wallace, San Jose, Cal.

RACK FOR KITCHEN UTENSIL COVERS

Tin covers for stew pans and kettles are a nuisance when not in use, as they are apt to slip off the shelf, if piled upon it, and are sure to get out of order so that one must search for one of the right size. To make a convenient rack for these covers get some strips of ½-in. boards, half of them 1 in. wide and the other half 3 in. wide and all as long as the shelf is wide. Have as many of each width strips as you have covers, or more. Fasten these strips with shingle nails to the bottom of a shelf that is about 5 ft. from the floor as

Rack for Kettle Covers

shown in the sketch. The strips should be fastened at various distances apart in order to accommodate the several sizes of covers. Place the covers with knobs or handles downward.—Contributed by J. S. Wallace, San Jose, Cal.

EASY METHOD OF BURNING 50 BUSHELS OF CHARCOAL

In our February number instructions for burning 100 bushels of charcoal were given; the accompanying directions are for a smaller quantity—say, forty or fifty bushels.

Pick out a spot where rocks are not too plentiful and where perpendicular walls of ground will not crumble too easily and dig a hole 6 ft. long, 4 ft. wide and 6 ft. deep. Cut into lengths of about 4 ft. 7 in. enough of sound dry wood to fill the hole. Pile the wood alongside the hole where it will be within easy reach. Get an armful of dry kindling, split lengthwise, and a couple of armfuls of green evergreen brush or green hay (wet gunny sacks will do as well).

Put the kindling at the bottom of the hole and set it on fire; next pile in the wood on top of it, packing it close together. For the first 2 ft. work rapidly. Proceed with the filling until the hole is full and round it up a little, making it highest in the center. Then lay on the covering material—green grass, wet sacks or whatever it may be. Spread this material along the center, leaving a 6-in. space at the edges of the pit uncovered, then throw dirt on the covered portion. The 6-in. space left is for ventilation and escape of smoke.

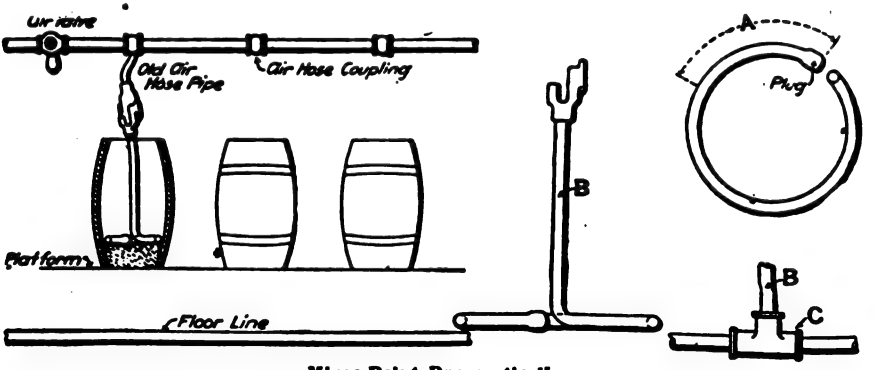
The pit will not require much tending. When the flames break through, close it a little at that place, but not more than is necessary. By starting the burning at six o'clock in the morning, the material will be burned to coal by nine o'clock in the evening—fifteen hours. Along in the afternoon the fire will be getting pretty well to the top. Tramp on the pit, and if any holes in it can be felt, remove the covering at those places and trample in some short pieces of wood about a foot long until the hole is filled up even with the top, then replace the covering. Toward the last it must be watched closely, as the flames are apt to break out.

If for fifteen hours a thick cloud of smoke has rolled above the pit, at the end of that period it should be burned to coal. Put damp covering over the 6-in. marginal space, pile on dirt to a depth of 8 or 10 in., wet it and trample down till solid. In the morning wet the dirt again, thoroughly. In two days the coal may be dug out.

Choose a still day without wind for burning; foggy or rainy weather will not affect the burning.—Contributed by John H. Evans, Dewey, Montana.

HOW TO MAKE A PNEUMATIC PAINT MIXER

A pneumatic paint mixer may be made of ½-in. iron pipe, with an air hose coupling attached to the upper end and the lower portion of the pipe bent into a circle slightly



Mixes Paint Pneumatically

smaller in diameter than the inside of the bottom of the barrel. In the circular portion, drill a number of ⅛-in. holes spaced 2-in. centers. Air escaping through these holes, agitates the paint in the barrel and mixes it thoroughly. The end of the pipe in the circular portion may be merely plugged up, but is apt to clog in the section indicated at A, because the force of the air expends itself before this point is reached. Probably a better way would be to connect B to the ring by a T, as shown at C, so that the air will circulate from both directions, says the Canadian Machine Shop.

The mixer may be connected to an old air hose and this, in turn, connected to the main line with an air hose coupling.

Contributions to our Shop Notes department are invited. Brief, clear descriptions and rough sketches are acceptable.

Life subscription to Popular Mechanics, $10; five years, $3.

ACID-PROOF INK FOR ZINC

An acid-proof ink which may be used with a drawing pen on zinc, says the Draftsman, consists of 1 dram verdigris, 1 dram sal-ammoniac powder and ½ dram lampblack mixed with 10 drams of water.

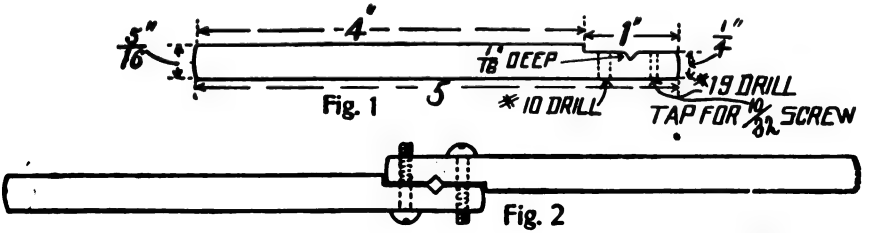
MENDING PORCELAIN AND GRANITE WARE

Porcelain and granite ware, which cannot be soldered, may be mended satisfactorily in the following way:

Mix together litharge and glycerine to about the consistency of putty and then apply to part to be mended. Apply it at each side of the hole and press it through, then finish off smooth and let dry. When dry it will be as hard as the porcelain and will withstand any heat that porcelain will.—Contributed by W. C. Telford, Santa Barbara, Cal.

SIMPLE TAP WRENCH

A simple tap wrench is made of ⅛-in. steel rod in two parts each 4 in. long. One end of each part is treated as shown in Fig. 1. Fig. 2 shows the two parts joined to form the wrench.—Contributed by M. Frank Jordan, 45 Jackson Pl., Chicago.

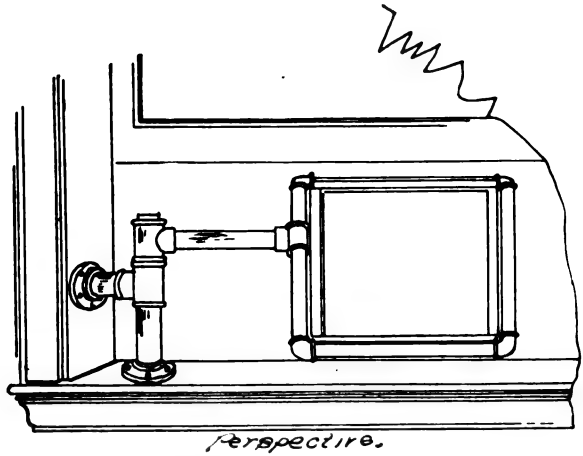


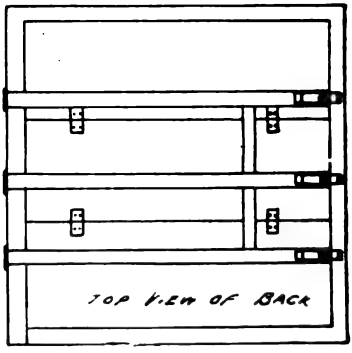
Handy Tap Wrench

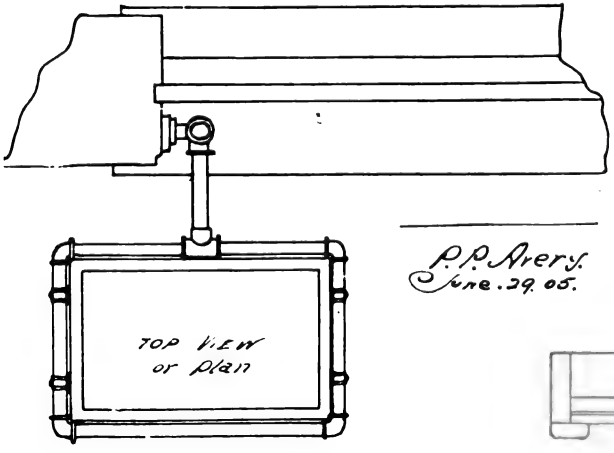
HOME-MADE BLUEPRINT FRAME

The frame itself is made of pine wood, bound on the corners with iron corner bands. The sides should be at least 1¼ in. thick by 3 in. wide, and the front piece which is planted on the edges of the sides, should be 1¾ in. by 1¼ in. and screwed on very securely; they must lap over about ½ in. on the inside of the frame to make a rest for the glass. The back should be made in three pieces, held together by hinges, and should be ⅝ in. to ⅞ in. in thickness, according to the size of the frame.

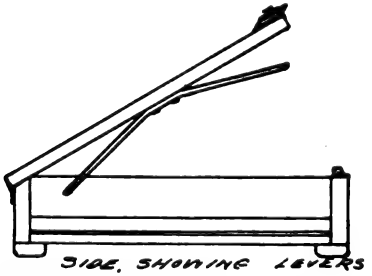
In the building of this frame, the most time should be given to the spring levers, which must be accurate and have close contact. The levers are hinged to the side and are pressed down on the back, forcing the back of the frame tightly against the glass by the three brass springs and being held in place when down by three cupboard door snap locks. The three levers should be held together and in line by the iron or wood brace across their backs, this brace is very essential and should be securely attached. A thick piece of felt should always be laid on top of the paper so that the back may bear evenly on the print and make close contact between the blueprint paper and the tracings, which fact is absolutely necessary. The iron frame as shown, is ordinary black iron pipe, ½. in to ¾ in., according to size of frame, and the stand, which is fastened to the window trim, is heavier weight, 1½ in. to 1¾ in. The collar must fit snugly around the nipple, and a drop of oil once in a while is necessary. After the iron frame







P. P. Avery.
June. 29. 05.



Home-Made Blueprint Frame

is built, it is a good plan to set-screw the connection between the frame and arm, as this joint would have a tendency to drop down on the treads. The frame can then be revolved on the arm treads, to put in the drawings and then turned glass side up and swung out the window to print. I have made and set up one of these frames in our drafting room, and it has given universal satisfaction.—Contributed by Prentice P. Avery, 39 Woodside Av., Ridgewood, N. J.

PRESS STOPPING DEVICE

The accompanying illustration shows an arrangement installed by W. Schafer of San Francisco, Cal., on a press used for baling dry goods, to stop the press in case of a careless packer letting it run up too far. As the movable platform rises, weight B, which is a little heavier than weight A on the other side, is pushed up and so lowers weight A (securely fastened to the cord so that it cannot move along it) and the lowering of weight A throws the circuit breaker, C. In case the man making a bale should neglect to stop the press when his bale is made, the circuit breaker will throw in the usual manner, so that it is not necessary to have any arrangement for stopping on the descent. The pulleys must be good ones and so arranged that the cord, when loose, will not work out of the groove. Mr. Schafer has used this device for about three years and states that it has never given trouble of any kind. This stop could be adapted to other purposes, for stopping elevators, for instance.

HOW TO MAKE AN S-WRENCH

From the scrap heap select a piece of good cast steel, ½x1 in. by 3 in. long (Fig. 1). Draw down the center and round the ends. At SS (Fig. 2) fuller to ¼ in. thick, and leave the middle a little thicker. Make holes

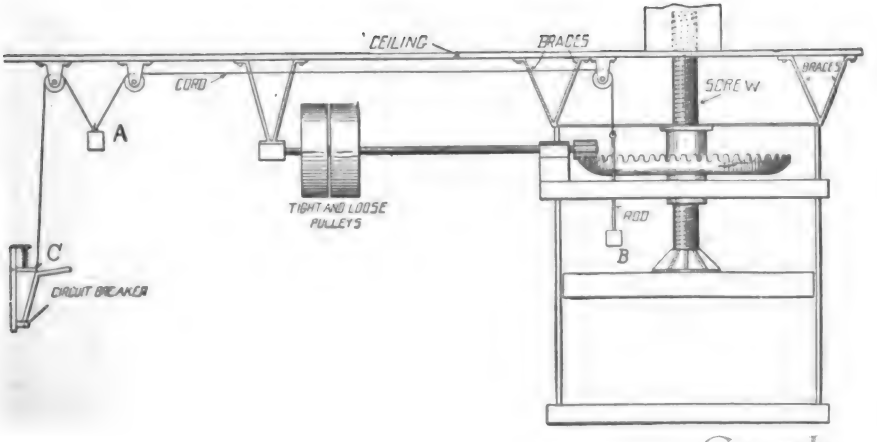
in the ends as shown by the dotted lines, Fig. 2, using a square punch. Put a flatter on and smooth up side nicely.

Cut out AA on both sides with a sharp thin chisel, which will spread the jaws. Round up again and shape like Fig. 3 to suit your taste. Heat to a cherry red and lay in some unslaked lime which will soften. Let it cool and then dress. Make one end for, say, ⅝, and the other for $\frac{5}{16}$, or any

Fig. 2


Fig. 3

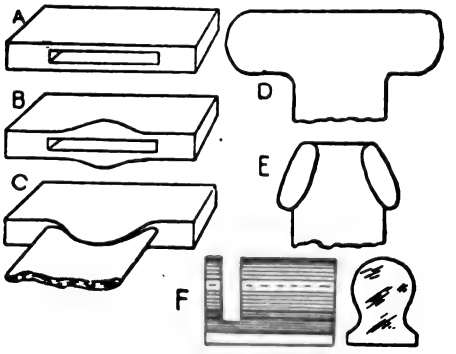
size you want. Now heat to a very low red. Lay it between two green pine boards or drop in linseed oil, says a correspondent of the Blacksmith and Wheelwright, and you will get a good color and a good temper.



Automatic Stopping Device for Presses

MAKING A SPRING HEAD

There are many smiths who do not know how to put a head on the upper main leaf of an ordinary elliptic spring, says a correspondent of the American Blacksmith. The following is an excellent method:



Making a Spring Head

Cut off steel the length wanted, less ½ in. for each end. The instructions are for only one end, but apply to both. Take 3 in. of ⅝-in. square Norway iron. Split through from one side as at A, and have the split the width of the steel to be used. Now fuller as at B, insert steel as at C and weld. Then trim as shown by the dotted lines at D. The ears can be bent in the vise, without danger of injury from cold, shut and should be bent as at E. Now dress up thread in the tool F, after fullering between the ears. Fullering will bring the ears parallel and after dressing them, the holes are drilled.

BORING ON THE TURRET LATHE

Boring to Size vs. Boring Undersize and Re-reaming by Hand

At one time I worked in a large manufacturing concern where all gears, sprockets, pulleys, collars, etc., were bored in the turret lathe by a system that, I admit, was new to me. I had worked in different shops, had seen many turret lathe fixtures and systems, but never before had I heard of boring articles undersize and reaming them to size by hand with an expansion reamer. The system I refer to could be bettered, in my estimation, by the suggestions offered below. Their boring was done by first running a drill, slightly smaller than the reamer, through, then reaming.

By use of a little oil and a new reamer a good fit could be secured, but it would not be advisable to keep buying new reamers; consequently when the reamer becomes slightly worn (which will happen in a very short time by continuous use) the bore will be small. If reamed dry, the bore will be too large, even with a worn reamer. The firm in question used oil on the reamer, which made the hole as small as possible, with the result that every piece had to be reamed by hand with an expansion reamer to obtain a good fit. In a large plant this labor of re-reaming will amount to a large sum in the course of a year.

I have often wondered why a system as explained below would not be satisfactory to others. I have rigged up turret lathes in this way, and it gave satisfaction in every respect. Furthermore work can be done more quickly, besides, no reamer is used.

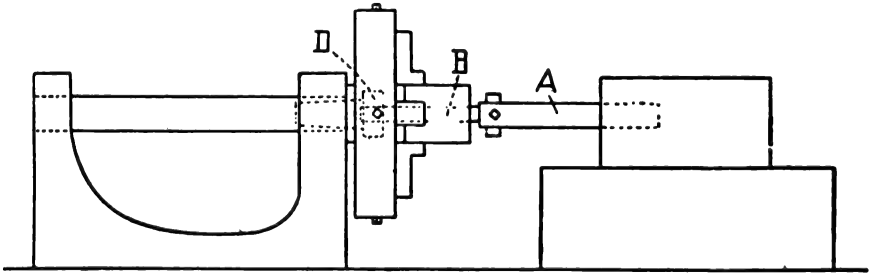


Fig. 1

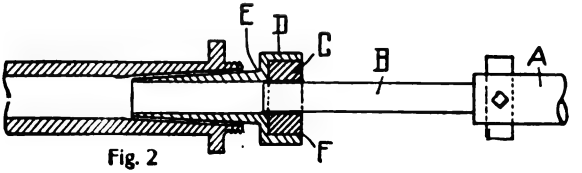


Fig. 2

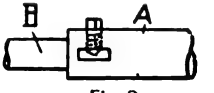


Fig. 3

Referring to the diagrams, Fig. 1 shows a view of the boring bar in position for boring. Fig. 2 is a sectional view of bar, bushing for same and lathe spindle. Fig. 3 shows the cutter in the bar and the method of holding it. In Fig. 1 and Fig. 2, A is the boring bar turned on end B, so as to pass through the core and enter the bushing C in the lathe spindle, which steadies the end of the boring bar. D is turned to fit in spindle with shoulder at E for bearing against the end of the spindle and is bored out at F, to receive different sized bushings, which are fastened in by a feather key and can readily be changed. The bushings could be placed directly in the spindle without the use of D, but D is used to keep the bore of the spindle from wearing, by frequent changing of bushings, etc.

The bar is fitted with cutters the same as a facing tool, but these are not held by a key, as they have to be centered exactly, because both sides cut and with a key too much time is lost in setting. The cutters are fastened as shown at A, Fig. 3. The cutter is countersunk to receive cone head set screw and it is turned to size while so fastened. It is obvious that when replaced, it will always be central and different sized cutters can be used by turning them to size in the same bar they are to be used in.

With the end of the bar supported in the bushing, all material can be removed in one cut and as the cutter is turned to size, and being straight from cutting edge, no reamer is necessary. One cutter can be ground an hundred times without changing the size of the bore.

While this method is very old to some, it will no doubt help someone who is still toiling away with a monkey wrench and an expansion reamer.—Contributed by Norman Baker, Hoopeston, Ill.

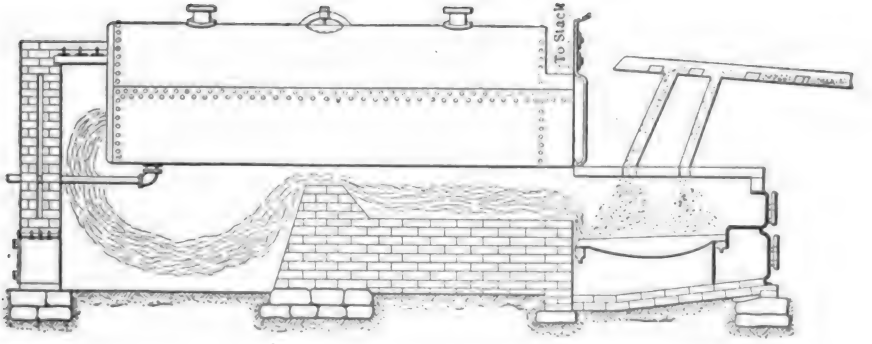
HOW TO BURN SAWDUST

A furnace and boiler setting like the one shown in the diagram is an excellent arrangement for burning sawdust, says a correspondent of Power.

The boiler setting itself is like that usually used in a horizontal boiler, but the grates are in an oven or projection built in front of the boiler instead of being under it. The oven is about 10 ft. long and should be full width of the boiler, or if convenient, 2 ft. wider than the boiler is preferable. The grates should have ¼-in. openings.

The sawdust, brought by a mechanical carrier of some kind is dropped through two chutes on to the grates and lies in two cone-shaped piles that cover the entire grate surface.

The fire should be started with shavings or other dry material and will burn principally around the edges where the draft will force itself up through the fuel. When well ignited the surface of the cones will be covered with flames and the sawdust will burn furiously.



Arrangement for Burning Sawdust

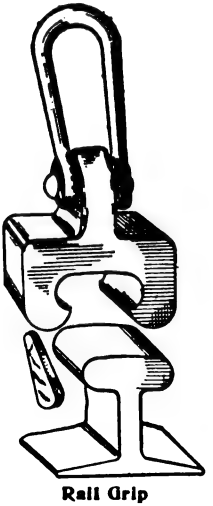
The supply of sawdust may be regulated by slides in the chutes. It is not necessary to use a firebar, simply fill up with the fuel and let it burn. To bank the fire at night fill the furnace well up to the top with the sawdust and level it off, close all doors and the damper and let it alone.

A threshing outfit equipped with a system of electric lights enables an Ohio thresherman to work till 10 p. m. during the busy season. The engine supplies the power for the dynamo and the lamps are attached to the separator.

If you want any machine or device and do not know where to get it, write us. Information free.

ANOTHER SAFE RAIL GRIP

The illustration shows a rail grab made by F. A. Crans of 207 Williams St., Waverly, N. Y., and used by Mr. Foley, wrecking foreman of the Lehigh Valley R. R. tool train located at Sayre, Pa. Mr. Foley says of this grip:



Rail Grip

"We are using the rail grab or grip in our wrecking equipment and it is a first-class grip, as it can be used in any place, and will fit any rail from 58 lbs. to 90 lbs. We have two of these grips and we use them very often for a stop to put ahead of our steam crane on the rail at the end of the track to keep the crane from moving when we have a hard end pull."

Anyone wishing details of construction of this grip may secure them by writing Mr. Crans.

REPAIRING A CRACKED WATER JACKET

A cracked water jacket in a gas engine is a common trouble. Often cylinders and cylinder heads that could easily have been repaired are consigned to the scrap pile on this account.

In repairing, when the crack is rather open, it is best to use a piece of sheet copper for the patch, as it can be hammered into almost any shape easily. The edges should be caulked to make them watertight, though sheet asbestos may be used as packing. The patch is best fastened on with small screws along the edges and not over an inch apart.

Small cracks may be repaired by forcing in solder with a blowpipe, or by driving a sharp-cornered cold chisel along the crack, making it wider and deeper near the outside, then pounding in a piece of lead wire or a narrow strip of lead and the job is done.—Contributed by Royal Wolfe, 915 S. Broadway, Lancaster, O.

We are always glad to receive contributions to this department from our readers. Make your story concise but plain.

SOME ELECTRIC PLANT TROUBLES AND WHAT CURED THEM

In an extremely interesting series of articles on "Experience on the Road," H. L. Stephenson, an electrical expert, tells in the Electric Journal some of the things he saw, from which the following are selected:

A RUNAWAY ENGINE.

A recent case of trouble with an engine will serve to illustrate the point. This particular engine was a small, high speed, piston-valve type, direct connected to a 75 kw. lighting machine to be driven at 270 r. p. m. When this outfit was started and the engine given full steam pressure, the first speed would probably be 276, and as quickly as another could be taken, 281, then 287, 293, 297, 301, 310, continuing to creep up slowly. With any load from ten kw. up, the speed regulation was very good, but whenever the load was thrown off, the speed would begin to creep. We ran it throttled until all of its parts had reached an even temperature, but with no better results. The engine-man then took out the valve to look for steam leaks but it seemed to be in good condition and a trial showed that we had not improved it. An improvised device showed that the governor did its work so that it looked reasonable to believe, despite our indicator cards, that there must be some error in the valve setting. This was checked over, and the piston was taken out and examined. We took cards until there was no more paper to fit the indicator. And so it went for three or four days, until we got hold of the theoretical curve such as engine builders send out as a sort of an advertisement.

In comparing the card with one of our no-load curves the trouble was as apparent as though it had been printed in words across the paper. The valve leaked steam. Taking the valve out for the second time, we peined the inside of the rings to spread them out thereby increasing their pressure against the walls of the steam chest. We had solved the problem, for engines are not made that run better than this one now does.

A TRANSFORMER FIRE.

A telegraphic request, "Trouble with new transformer, send man at once," took the writer off once on an eighteen-hour trip. The customer had installed this unit and on putting it into service it gave entire satisfaction, but in two or three hours some one noticed smoke pouring from the transformer

house in such volumes that it was thought the whole building was on fire. An investigation showed that it was only the new transformer and a careful examination revealed nothing further than that the smoke came from the grease and dirt burning on two of its low tension terminals, which from all appearances had reached a temperature far above 100 degrees centigrade. The attendants were at a loss to account for this as these terminals were joined together by a short copper strap and were therefore necessarily at the same voltage and, of course, there could be no heating on account of a slight leakage of current jumping from one to the other. This transformer was of that type designed to give either 110 or 220 volts on the low tension side, and as it was operated on the latter voltage, this copper strap put the two windings in series. The reader can imagine the chagrin of the attendants when the trouble was remedied by sand papering this strap and the terminals and screwing up the bolts tight enough to make a good contact for carrying the current. As this transformer was run with a load very close to its rated capacity, we afterwards took the precaution to insert an additional jumper.

A TIME-HONORED TROUBLE.

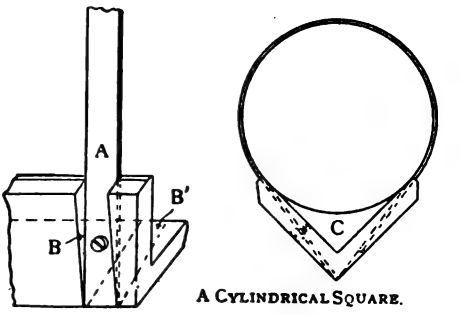
A paper of this kind would not be complete without mentioning some experience with the series fields of compound machines. Tell a roadman that a motor's speed is not right or that a generator will not hold up its voltage and the first thing that comes to his mind is the series field. This seems a simple thing, but any one with road experience can cite a number of cases where trouble was due to wrong connections on this part of the machine. It is not at all uncommon to find machines that have been run so long at an excessive speed to keep up the voltage at full-load, that the proper pulleys have been lost and when the trouble is discovered it takes a month or two before the change can be made and the generator belted properly.

Alternating-current apparatus is not altogether free from this same trouble. A good example comes to mind in the case of a composite wound generator which had been in service for two years, but only at the end of that time did it begin to receive anywhere near its rated load. A complaint was made that this machine would not hold up its voltage with the separately excited field having a drop of 110 volts direct current. As the reported full-load voltage was not excessively low we concluded that a bad power-factor was responsible for some of it and with that end in view an elaborate test was arranged to be taken in the presence of the officials of the power company. The engineer who went to the plant discovered that in all probability during the two years they had been running, the self-excited coils had been bucking against the separately excited winding and reversing this—well, the truth is, we do not care to hurt the feelings of any one by commenting on things of this sort. Reversing this cured the trouble.

HOW TO MAKE AND USE A CYLINDRICAL SQUARE

In sawing off square a piece of metal tube or rod in the vice a round-square is needed, and the box square can be converted into one in the following way:

A thin flexible steel blade and a small cheese-headed screw will be required. Referring to the left-hand sketch, the blade A must be parallel its whole length. Cut slots BB directly in line with each other and at



A CYLINDRICAL SQUARE.

right angles to either edge of the square. In the right-hand sketch at C it will be observed that this slot tapers towards the edge. This is to bring the blade close to the work being marked off, says the Model Engineer, London. The marking is accomplished by drawing the blade around the work into the slot in the opposite side and scribing off.

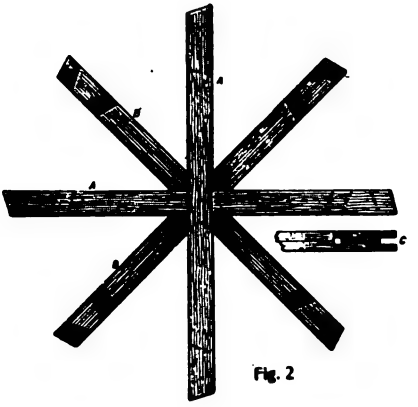
WEIGHT OF LEAD PIPE

The weight of lead pipe of any thickness and diameter may be determined by subtracting the square of the internal diameter of the pipe from the square of the external diameter (both in inches) and multiplying the remainder by 3.86. The result will be the weight in pounds per running foot.

HOW TO BUILD A CHEAP WATER WHEEL

The wheel should be made of good hard pine and the dimensions given are for a wheel 10 ft. in diameter and 4 ft. wide, but a wheel of any size can be made in the same way and in proportion, says a correspondent of the Blacksmith and Wheelwright.

Gain eight pieces of joist 2 x 6 in. by 8 ft. long as shown at G, Fig. 1, and put them together in pairs (A A and B B, Fig. 2). Bolt the two pairs together, making eight spokes or arms, and forming one side of the wheel. Against the offset or depression of 2 in. at the end of every second spoke on each side, fit a piece 2 x 6 x 42 in. long, made



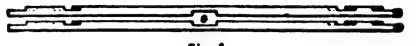


Fig. 1

as shown in Fig. 4. This will make the spokes 4 x 6 in. Between each piece and its spoke, near the ends, gain in as at C, Fig. 2, for the standards for the buckets. F, Fig. 3, indicates the standards for the buckets. They should be 2 x 4 x 16 in., tapered, and bolted clear through as shown. The faces of the spokes at this stage will all be level. To the outside as at E, Fig. 3, bolt a cast-iron plate 18 in. in diameter. This plate should have a hub H, of about 4 in. on the outside for set screws or keyway for fastening it to the shaft, and a short hub on the inside to go into the wood. Have the shaft about 3 in. in diameter and the buckets about 10 in. deep, 10 in. on the bottom and 4 ft. long.

The other side of the bucket is made in exactly the same way and the parts then put together.

CEMENT REQUIRED FOR SURFACING

The following table gives the amount of cement and sand required in several instances. From this table one can readily estimate other areas as may be required.

Bbls. of Cement.	Bbls. of Sand.	Thickness of Coating.	Area Covered in Sq. Ft.
1	1	1 inch	67
1	1	¾ inch	90
1	1	½ inch	134
1	2	1 inch	104
1	2	¾ inch	139
1	2	½ inch	208
1	3	1 inch	140
1	3	¾ inch	187
1	3	½ inch	280

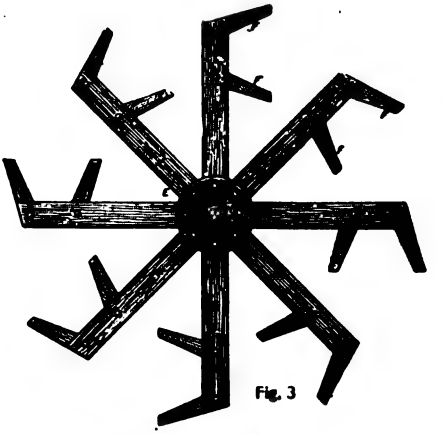



Fig. 4

MAKE THE SAW FIT THE WORK

"The right thing to do with any sawing machine is to use the smallest saw possible for the work." This is the deduction made by J. Crow Taylor in the Wood-Worker, after recounting how a man running a saw mill, thinking that there was no use in running a 16-in. saw for cutting a 1-in. board, cut down a number of thin and unsatisfactory 16-in. edger saws to 12 in. and secured excellent results, as well as saving power. By reducing the diameter of the saws, they were stiffened, and the volume of saw blade in the cut being reduced, a thinner saw could be run, with the same results produced with a bigger and thicker saw, requiring more power. Large collars are recommended for all kinds of circular sawing machines, also.

TO KEEP SHOW WINDOWS FROM SWEATING

If the window has no partition between it and the store room, make one of ceiling boards or of glass. Glass is preferable. (See

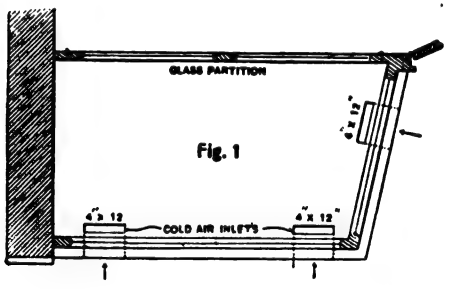


Fig. 1

Fig. 1, plan view.) In a window of ordinary size make three openings 4 or 5 by 12 in. Case these up tightly with galvanized iron or wood. A good way, says a correspondent of the Metal Worker, is to put in galvanized iron, then on top of the floor on the inside over the whole tack a piece of ¼-in. mesh wire screen, using small staples to

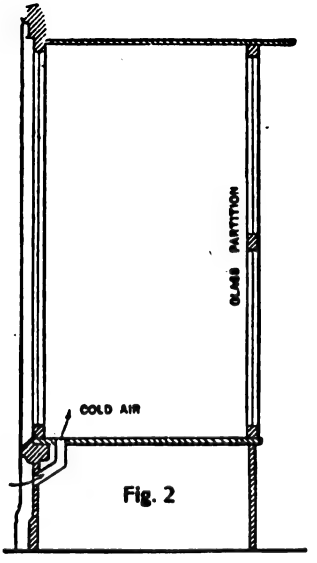


Fig. 2

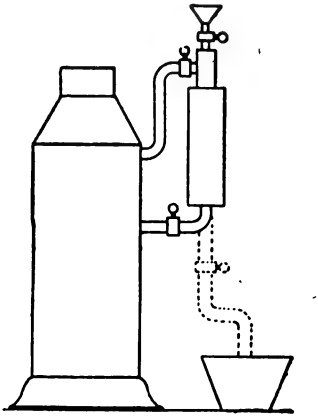
fasten it with. Fig. 2 is a sectional elevation. If this method is followed there will be no further trouble from sweating.

In lacing belts the pointed ends of the laces may be stiffened and made easier to insert by burning them.

IMPROVED EMERGENCY BOILER FEED

In regard to the emergency boiler feed described in our July number, A. G. Knight, of La Salle, Ill., writes as follows:

"I understand the emergency boiler feed was like the accompanying sketch. In place of the funnel on top of the pipe, the party could have run a pipe, as shown by dotted line and supplied with a valve; he could have poured the water into the tub on the floor. When the two valves connecting his apparatus to the boiler were closed the steam in the big pipe would condense, causing a partial vacuum. Then on opening the



valve to the tub the water would be forced up into the large pipe by atmospheric pressure."

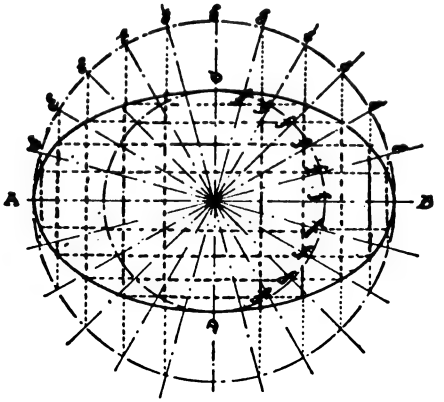
HEATING IRON IN COLD WATER

A lead-lined glass or porcelain vase or cupola filled with acidified water, to which is connected a strong positive conductor and a pair of tongs with insulated handles attached to a flexible negative conductor will constitute the forge and furnace of the future, declares Science and Art of Mining. Into the sour water the smith plunges his piece of iron, manipulating it with a pair of insulated tongs. The water is agitated with a boiling motion immediately, and the great resistance created brings the iron first to red, then to white heat and so quickly that that portion of the iron not immersed is but slightly warmed.

Is there anything you want but don't know where to get it? Write Popular Mechanics. Information free.

SIMPLE METHOD OF DRAWING AN ELLIPSE

An ellipse is a figure that is incorrectly drawn more often than any other geometrical design. A simple way of developing and laying out an ellipse is shown in the illustration. As all ellipses have two diameters, viz: major and minor, it is necessary to know these two points before one can be drawn.



To Draw an Ellipse

Describe a circle with the length of the major axes A B of the ellipse for its diameter; then describe another circle, using the same center as the first circle and having for its diameter the length of the minor axes C D.

Divide the circle in any number of equal parts—the more, the easier to draw and the more perfect the figure will be. The figure in the illustration is divided by twelve lines passing through the center. Draw lightly the perpendiculars, using the points of intersection on the outer circle marked "e," then the horizontal lines indicated "f." By then connecting the first points of intersection, e and f, as shown in the sketch, a perfect ellipse will result.

Any ellipse may be drawn in this way and it saves the trouble of making the trammel and guider that are so commonly used.—Contributed by Jos. E. Stanton, Los Angeles, Cal.

FLEXIBLE VARNISH

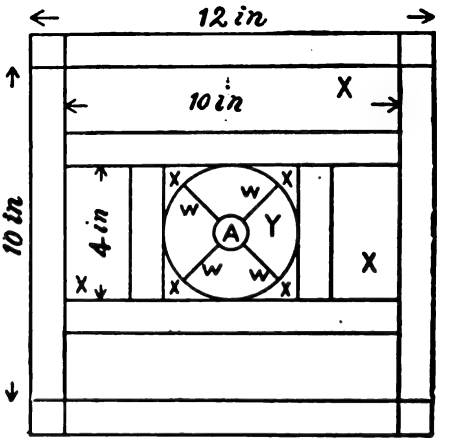
This varnish is sometimes called "balloon varnish." Boil together 2 gal. linseed oil, 6 oz. copperas, 6 oz. sugar of lead and 1 lb. litharge, stirring constantly. When it strings well, remove from fire and when cold, thin, if necessary, with drying oil.

METHOD OF PROTECTING WATER PIPES FROM FREEZING

To properly protect pipes is perhaps a little expensive, but the extra expense will save greater expense in the long run, says the Rural New Yorker.

Make a 4-in. pipe of heavy galvanized iron in sections like stove pipe, each section made to slip over the next. In every second section run four copper wires through holes in the pipe on four sides and opposite to each other. Solder the wire on the outside and solder the holes up tight. As each section is put on over the water pipe fasten the wires so that the water pipe is in the middle of the galvanized pipe. If it is not possible to disconnect the water pipe in order to slip the protection pipe over it, crimp and fasten at the top and bottom with small short stove bolts, having the screw heads on the outside. Put the boards on as shown in the diagram. Be sure to always break the joints. Leave the pipes bare.

In the diagram, A, is water pipe, W, wires for holding pipe in the center, the circle represents the 4-in. galvanized iron pipe, and the rest are 1-in. boards carefully trued. Put two thicknesses of paper under each



Protecting Water Pipes

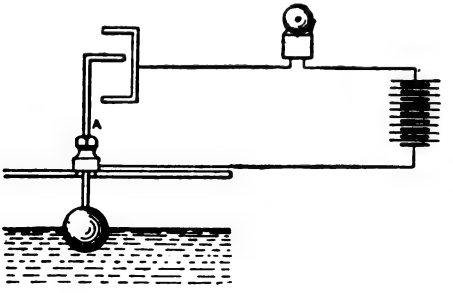
joint to act as an air-tight washer. X represents dead air spaces and Y inner dead air space.

Do not let the water run in the hope of preventing freezing, unless the supply is from a windmill. On very cold nights set a lamp in the box to heat the air. Have the chimney of the lamp of tin 8 or 10 in. long, and fit it tightly through a hole in a piece of tin under the box. Use a ½-in. wick.

This plan was tried on a 60-ft. standpipe under a tank and a 32 ft. pipe each 1½-in. diameter, and was found to work to perfection

SIMPLE HIGH AND LOW WATER ALARM

A high and low water alarm that is exceedingly simple and wholly dependable is designed for use at the top of the boiler. The bell is installed and connected up as shown



High and Low Water Alarm

in the illustration. Contact is provided for by a rod of very small diameter attached to a float. The packing, says the Engineer's Review, is soaked in oil and ground graphite so there is the minimum of friction on the rod.

HOW TO WIND A SINGLE CYLINDER MOTOR

To wind a single cylinder motor, using three and four terminal coils, connect the primary wires to the end binding posts, and always have the secondary on top of the coil. The Motor Age gives a number of diagrams showing the arrangement for several numbers of terminal coils.

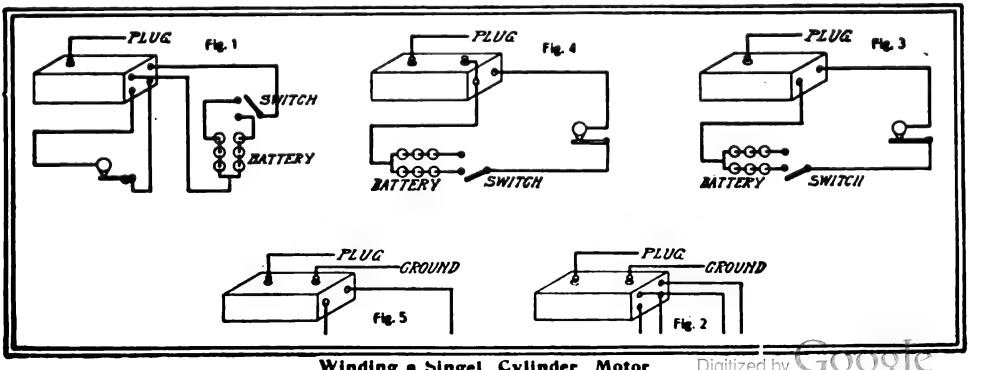
Fig. 1 represents a five-terminal coil, with two sets of batteries and but one secondary terminal. A wire is shown connected to the circuit breaker cam, but in making the connections this wire is always grounded on the engine. Fig. 2 shows a six-terminal coil, the primary being connected as in Fig. 1, and the extra secondary is grounded to the motor. Fig. 3 is a three-terminal coil, Fig. 4 a four-terminal coil, and Fig. 5 is another way to connect the coil of Fig 4. These diagrams represent the usual methods of connecting coils with terminals from three to six.

MATCHES FOR CUTTING GAGE GLASSES

The easiest method of cutting gage glasses is with red-headed matches. Measure off the glass, wet the head of a match thoroughly, and with it mark a circle on the inside of the glass at the point where it is to be cut. Strike another match, hold it on the outside of the glass under the marked circle and the glass will break off with smooth edges at the point marked. The trick can be done with but one match, says a correspondent of Power, and is so simple and easy that a gage cutter is wholly unnecessary. If you cannot reach far enough into the glass the first time, make a second cut.

GRADE THE STEAM PIPE

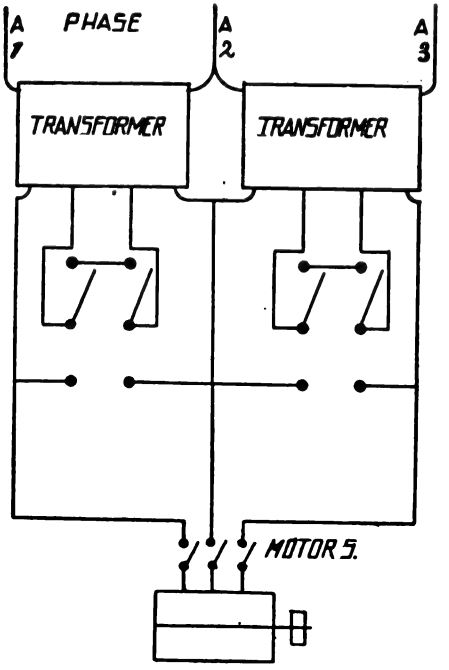
The steam pipe should be graded from the boiler towards the engine, says the Practical Engineer, because the water of condensation can move in no direction save along with the steam. Provision for catching or disposing of this water should be made at the engine.



Winding a Singel Cylinder Motor

SUBSTITUTE FOR AUTO STARTER

We recently had an auto starter for a 50-hp. three-phase induction motor burn out and were badly in need of motor, but could not use same on account of large starting



Auto Starter Substitute

current and our small generating capacity, writes H. H. Cloyd, of Trenton, Mo.

The transformers for this motor were located close by and with the use of two D. P. D. T. switches I made the transformers take the place of the starter by cutting the starting voltage from 200 to 100 volts at transformers' terminals. With this voltage the motor started with very little jerk on our line and with about 60 per cent of its rated load. The enclosed rough sketch will show use of switches.

One 4-pole D. T. switch would be much better, as with the two D. P. D. T. switches both must be thrown at the same time. This will also apply to any two-phase motor, also three-phase and three transformers, provided another switch is added.

Referring to sketch, when the switches are thrown downward the secondary coils of the transformers are in multiple, giving the motor 100 volts starting current. Throwing switches upward simply short circuits two middle transformers' leads, throwing secondary coils in series, giving motor 200 volts, or its rated voltage. The upper switch terminals act simply as single pole switches.

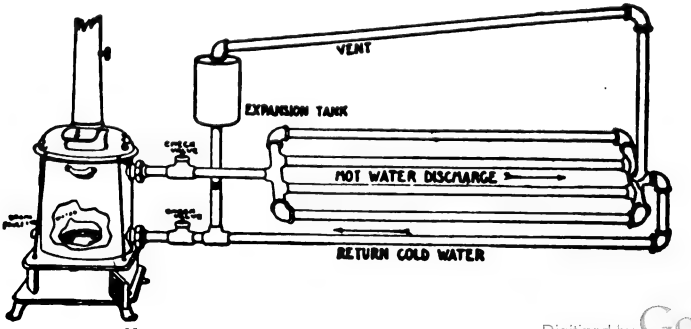
This idea, though not always practical, might be of some good if any one were caught as we were without immediate means of repairs.

SIMPLE BABBITT LADLE

When rebabbitting stern bearings, or any time I need a ladle, I take a piece of 2-in. gas pipe, 18 in. long and put an elbow on one end and the ladle is made. To make the metal run readily take a good chisel and dig a trench through the threads on the elbow.—Contributed by E. S. Stout (marine engineer), San Pedro, Cal.

HEATING SYSTEM

The system of piping shown in the illustration used in connection with a small laundry or tank heater is suitable for heating a stable, small conservatory or a chicken house. The system is cheap and simple to rig up, says Domestic Engineering. The illustration explains the connections and most of the materials can be picked up at home.



Heating System for a Stable or Greenhouse

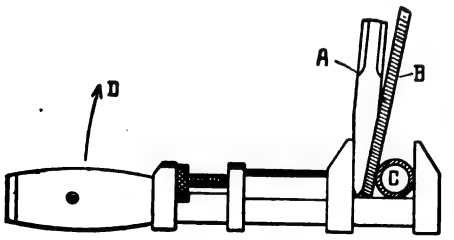
All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

SUBSTITUTE FOR PIPE WRENCH

The hot water front was to be removed from my stove, but I had no pipe wrench. I had a 12-in. monkey wrench, a cold chisel



Substitute for Pipe Wrench

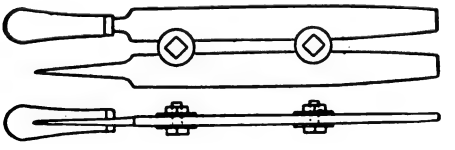
and a flat file, however, and the sketch shows how the job was done. A indicates the chisel, B the flat file, C the pipe and D shows the direction of pull. It took all the power I could exert on the wrench to start the pipes, but it did the work.—Contributed by W. L. Dines, Jr., 74 Mason street, Worcester, Mass.

TO TEST TURPENTINE

To test the purity of turpentine drop a small quantity on a piece of white paper and expose to the air. No trace will be left if the turpentine is pure; but if it contains oil or other foreign matter, the paper will be greasy.

SUBSTITUTE FOR AN OFFSET FILE HANDLE

Take two files and bolt them together, one on top of the other with suitable small bolts. Two ¼-in. or ⅜-in. bolts with nuts



Substitute for Offset File Handle

and two washers each will do nicely. This makes a simple and convenient substitute for an offset file handle.—Contributed by M. M. Frickling, Southern Railway Shops, Columbia, S. C.

HOME-MADE STEAM WHISTLE

This whistle may be made from whatever materials one may have on hand and so the dimensions may vary with the requirements.

Take a piece of pipe, say, ¾ in. for the whistle stem and 3½-in. pipe for the bell and base. Put a thread on the stem long enough to reach through the whistle base and make connection. Mark the stem flush with the top of the whistle base and cut a thread on

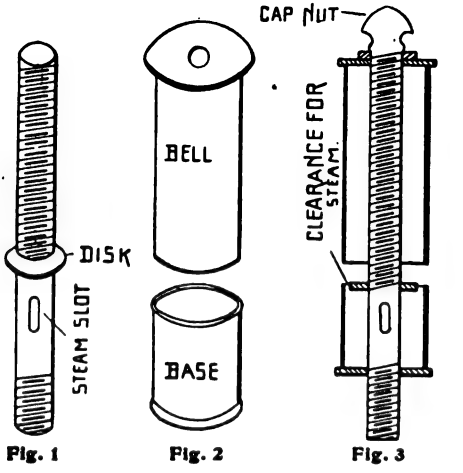


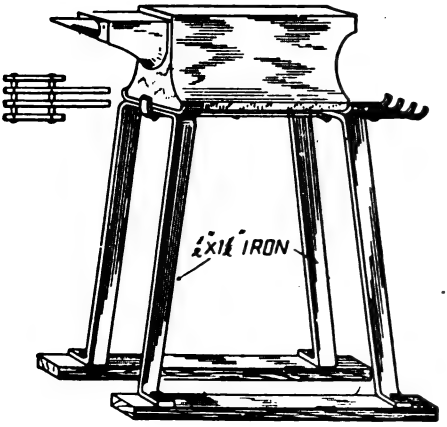
Fig. 1 Fig. 2 Fig. 3

that end all the way down to the mark, in order to get the disk down just flush with the top of the base, and leave a clearance of about 1/32 in. between the walls of the whistle base and the disk. Cut holes in this stem just below the disk for steam. Now screw on the bell, which should be tapped the same size as the stem, until it comes over the opening in the base. Then screw on a cap nut and you have a pretty good whistle.—Contributed by L. C. Haskine, 366 6th street, Laramie City, Wyoming.

IMPROVED HOME-MADE ANVIL BLOCK

The anvil block shown in the sketch is made of 1½x½-in. iron, which is about ordinary wagon tire—something that most blacksmiths have on hand. The feet are bolted to 2x4's, which may be nailed or otherwise fastened to the floor.

The advantage of using such a block is



Home-Made Anvil Block.

that it is not in the way when bending a long piece of iron. With a wooden block one cannot make a square bend in a piece of iron that comes down over the block, unless the block is small, and especially one cannot make the bend over the center of the anvil. With the iron block the work comes between the legs of the block.

The shelves on the block can be removed when in the way and are handy for holding tools. Underneath the anvil there is room for scraps of iron and tools that are used very often. A sledge may be used on the anvil without affecting the block.—Contributed by B. W. Woldridge, Hickory, Mo.

HOW TO DEMAGNETIZE A SAW

One of our readers asks how to demagnetize a saw. He laid a saw on the floor of an electric car and next day when filing the saw, found that it was so highly magnetized that he was obliged to brush the filings off constantly.

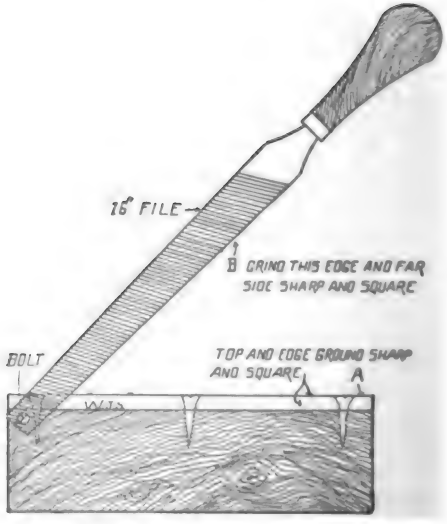
One way is to let the saw fall a few times on the floor. If this does not work, try the following plan: Attach a string to the saw and twist the string. Hold the saw over the place where it was magnetized while the electric car is in motion, or over any other dynamo. Then walk slowly away from the field of the dynamo or motor (which is sometimes a distance of six or ten feet), allowing the string to untwist and rotating the saw.

CHEAP SHEARS FOR CUTTING TIN

The materials required for this device are two old 16-in. files, a small bolt, a block of wood and a couple of screws.

Cut one of the files to the length you wish the knife (A in the sketch) to be and grind one side and one edge sharp and square. Drill holes in the top for fastening the knife to the block of wood, using the screws.

Grind the top and an edge of the other file (B) sharp and square. Drill a hole in the end of the file and one in the end of the block and mount the file with a bolt. These



Shears for Cutting Sheet Metal

shears are handy for cutting tin, sheet iron etc.—Contributed by W. J. Slattery, Emsworth, Pa.

CAPACITY OF A HOPPER

Multiply, in inches, the length by the breadth and multiply this product by one-third the depth. Divide by 2,150.4 and the answer will be the number of bushels the hopper will hold.

TROUBLE ALARM FOR GAS LIGHTING SYSTEM

In response to the request in our July issue for a trouble alarm plan for a gas lighting system a number of our readers have favored us with replies and diagrams.

Figure 1 is submitted by Geo. W. Bentley, Chicago, and shows the right wiring for Mr. Williams's system as it now stands.

Figure 2 is a system of wiring recommended by W. J. Slattery, of Emsworth, Pa.

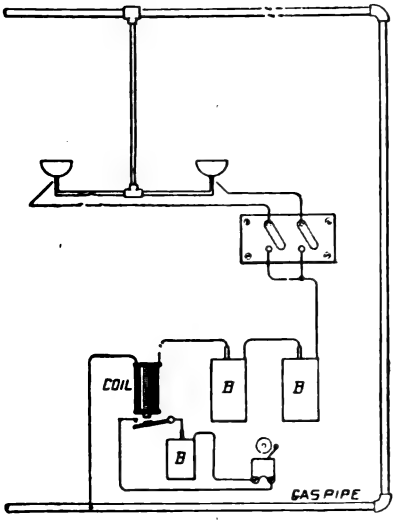


Fig. 1

A is the spark coil; B is a soft iron armature suspended in front of the coil about ¼ in. from the iron core of the spark coil; C is a regulating screw and binding post, such as is used to regulate induction coils. In case of ground the soft iron armature and the soft iron core of the spark coil will contact, closing the circuit at D and ringing the alarm. Harry W. Krug sent in a plan essentially the same as Fig. 2, and says:

"The bell will ring for a second every time the gas is lighted or extinguished. If the same battery is used for the five lights it is best to use marked or tagged wires so that a ground can be located. Each wire should also be provided with a separate switch. When the bell begins to ring, open one switch after another. The one last opened before the bell ceases to ring is the grounded circuit."

Figure 3 is sent us by J. M. Berger, 717 9th street, N. W. Washington, D. C. A soft iron armature is pivoted on one end of the spark coil (see A in sketch) and one wire of the alarm circuit is connected with it. The other wire is connected at B. In case of a ground the core of the spark coil attracts the armature and closes the circuit at B. Mr. Berger says:

"It is a very good plan, when you are going to use a large number of burners in a house, to run a separate wire to the battery for the pendant circuits and also for the automatics. That is, make a separate circuit for each floor and a circuit for the automatics on each floor to the battery wherever it may be placed, then connect them to switches. This will be found a very good arrangement and costs but a trifle more. When a ground occurs with a system arranged in this manner it is only necessary to open the switches in succession until the circuit that is in trouble is reached. This switch should be left open and the fault traced while the rest of the lighting system is left in full working order."

The installation submitted by J. H. Eddleman, Philadelphia, Pa., corrects the faults in Mr. Williams' system. He says: "Mr. Williams has his spark going through his bell. If he will ground wire A with gas pipe and connect wire B with wire between sparking coils and batteries his bell will give an alarm whenever there is a short circuit or ground any place along his system. I use six wet batteries." The arrangement is shown at Fig. 4.

In a diagram submitted by A. M. Larson, Minneapolis, Minn., the wiring of the lighting circuits remain the same as in Mr. Williams' plan. At A, Fig. 5, however, an arma-

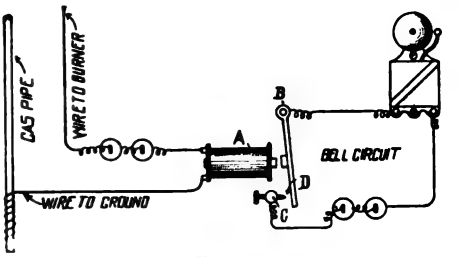


Fig. 2

ture lever, kept away from the end of the spark coil by means of a small spring of sufficient strength, is introduced. This lever is connected to one terminal of an independent bell circuit, the other terminal is

connected to a small metal point to the right of the lever. When a switch is closed, completing one of the lighting circuits, the gas is turned on and lighted, and in the meantime the current passing through the coil has made a strong magnet of the core, which, acting upon the lever, draws it until it touches the metal tip, thus completing

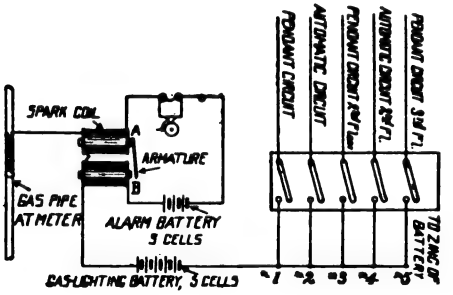


Fig. 3

the outside bell circuit. As the lighting switch is usually operated by making two or three quick connections, if the system is working properly, each switch, when thus operated, will cause the bell to make these same short rings. A short circuit would cause continuous ringing. A break in the line would be indicated by no action in the bell whatever. With this plan the electric door bell of the house could be used as the alarm, or, if desired, a cut out switch could be introduced and use it merely as a test, whenever desired.

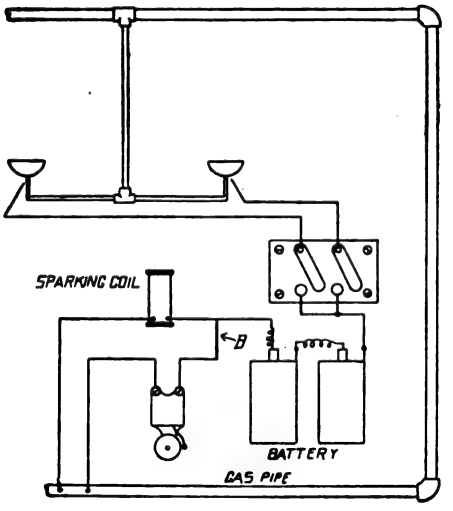


Fig. 4

Figure 6 shows plan of wiring as suggested by Geo. S. Barnet, Chicago, the principle being the same as in Fig. 5. Mr. Barnet suggests putting the bell in the basement, or other out-of-the-way place, as it taps every time the gas is lighted.

"Providing the resistance in the sparking coil is greater than the resistance of the bell, there is no excuse for Mr. Williams' system failing to work," writes D. D. Morin, Chicago. "If the resistance of the coil is lower than that of the bell, it can easily be seen that the greater part of the current will flow through the coil and to the ground, thus leaving very little, if any, to pass through the bell.

"The reason the alarm failed to work after a time, must have been that the batteries had become exhausted by ringing for some time without his knowledge. I would suggest that he put a two-point switch between the coil and line that comes from the lighter, so as to cut out the coil entirely, thus giving the bell the full benefit of the current. Of course, the switch must be put on the coil before he attempts to light the gas. Referring to Fig. 7, when the switch is on at A, the coil is in position to be used; when on at B, the alarm bell is in position. If the switch plan is not convenient, he might replace the bell with a 'drop,' so that when the lighter becomes grounded or short circuited, the 'drop' will fall and thus close a local circuit having a closed circuit battery in it, so the bell can ring for some time without injuring itself or the other circuit. Referring to Fig. 8, switch No. 1, when on C, is used on the coil; when on D, is used to throw the drop. Switch No. 2 is used to stop the bell from ringing when the drop contacts at A."

W. S. Hodill, East Liverpool, Ohio, repeats D. D. Morin's statement in regard to resistance, and suggests merely adding another battery so that more current will pass by way of the bell.

L. J. Voorhees, Sayre, Pa., says it is uneconomical to divide the current in this way, and recommends putting in a switch as shown in Fig. 9. In this plan when there is a short circuit in the line A, B or main circuit for lights, it magnetizes the core of coil C, causing the steel spring D to come in contact with point E, causing a circuit through battery and bell without interfering with the main circuit in any way.

In Fig. 10 the connections of automatic

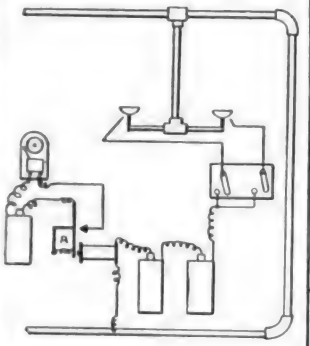


Fig. 5

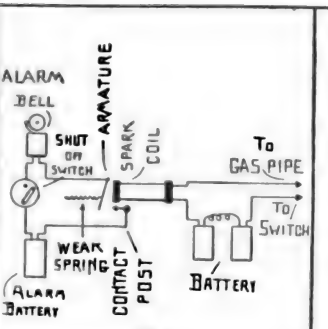


Fig. 6

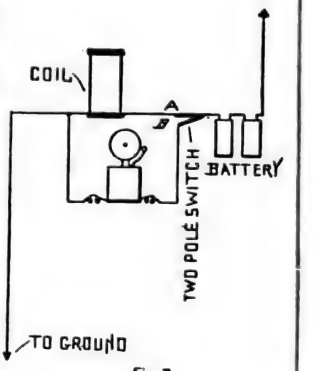


Fig. 7

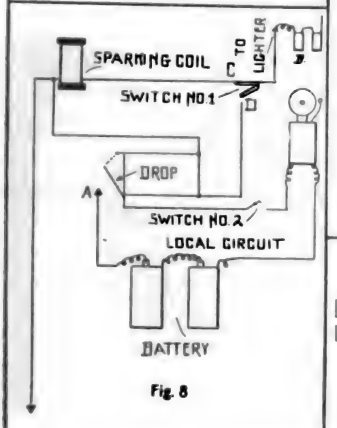


Fig. 8

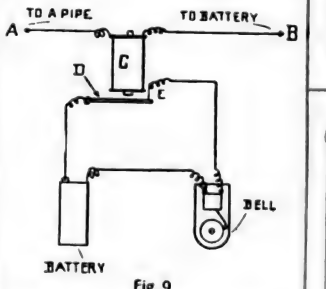


Fig. 9

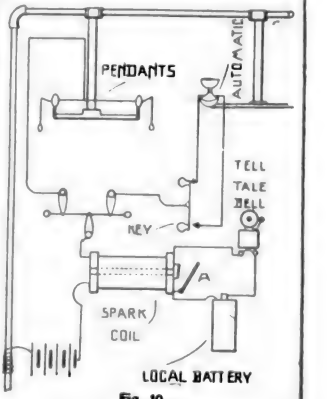


Fig. 10

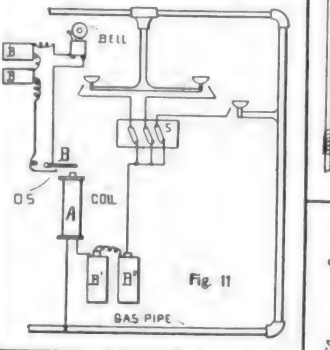


Fig. 11

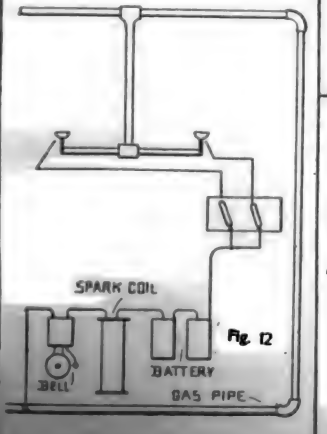


Fig. 12

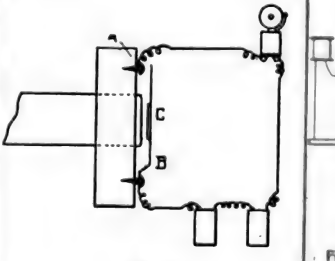


Fig. 13

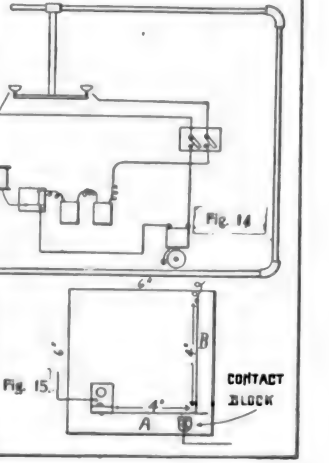


Fig. 15.

and pendant burners, also the tell-tale bell on a separate circuit, is shown. The armature, A, is pivoted to the end of the spark coil and held a short distance away from the magnet core, either by means of a spring or by gravity, in such position as to be attracted by the magnet core when the circuit is closed, thus closing the local circuit. This will show a heavy ground or a short circuit, writes Wm. Lachman, Chicago, but a slight leakage, which is a drain on the life of the battery, must be found with the aid of a galvanometer or magneto.

In Fig. 11, plan submitted by Wm. T. Hall, Chicago, A represents a spark coil, with the end of one wire grounded to gas pipe, while the other end passes to terminal of battery cells, and thence to switches, S. A lead of wire is then run to each gas jet in service, and the gas can be lighted by operating pendant. For detecting ground and short circuits, B is a spring with a soft iron at one end and fastened at the other. O S is a second spring made fast at one end. The terminals of two cells of batteries with a bell in series is connected to the springs as shown in the diagram. When short circuits or grounds occur, the iron core of the spark coil will become magnetized, thereby attracting B, which, in turn, will contact with O S. This closes the circuit and causes the tell-tale bell to ring. Trouble can be located by opening switches.

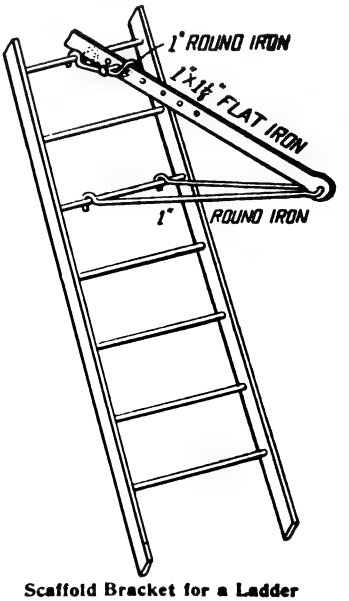
In Fig. 12 the bell is in series with the lighter spark coil and batteries. The plan is suggested by J. S. Gibbs, Dallas, Texas.

Henry H. Peebles, of Cleveland, Ohio, sends us Fig. 13, and says: "Make a relay on end of spark coil and connect in series with a bell and battery. Contact, in case of trouble on the line, will be at H. The spark coil to be connected up in the usual manner."

W. J. Barber, North Adams, Mass., comments on Mr. Williams' system as follows: "The alarm resistance wire should be of suitable size to operate upon the circuit in question. If of high resistance, or very long, or very fine wire, resistance wire should be fine also. In Fig. 15 the contact arrangement is shown. A is a spring tending to touch the contact block and B should be iron wire about 22 or 24 B. & S. gauge. (For wiring plan, see Fig. 14.) The idea is to let all the current that goes to lighter or burners traverse the spring and resistance wire, so that if it is on long enough to heat the same, it will expand and allow the spring to touch the contact of the bell circuit. The time element is governed by the size of the wire, longer wire being slower to respond. The alarm can be gauged to sound in from 10 seconds to two minutes after ground or short circuit.

SCAFFOLD BRACKET FOR A LADDER

A good scaffold bracket for a ladder is shown in the accompanying illustration. It is made of 1x⅛-in. flat iron and 1-in. round iron. The key-holes at A are for adjusting



Scaffold Bracket for a Ladder

the slant of the ladder. The bracket may be used on the inside of the ladder for low work, or on the outside for high work.—Contributed by G. B. Hiskey, Berlin, Nevada.

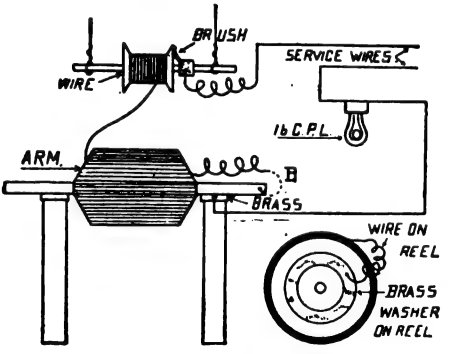
TO DRIVE FLIES FROM THE HOUSE

During the fall flies are often a greater nuisance than at any other time of the year. A good way to rid the house of them is to saturate small cloths with oil of sassafras and lay them in windows and doors. The flies will soon leave.—Contributed by B. F. Lamb, Minier, Ill.

The Department of Agriculture are experimenting with the cold storage preservation of seeds which, if kept in a warm place, are subject to attack from insects which hatch eggs among the seeds.

TO DETECT GROUNDS AND SHORTS

The outfit illustrated herewith is useful for detecting grounds and shorts in armature and field winding and saves the extra work of testing every now and then.



Ground Detecting Device

When there is a ground the 16 candle-power light is turned on. Shorts may be found by connecting wire B to the brass box as indicated by the dotted lines. If there is any amount of wire on the reel, the light will burn dimly and when a short is made in the winding the lamp will burn brighter.—Contributed by B. R. Van Valkenburg, 2212 E. Lake Ave., Seattle, Wash.

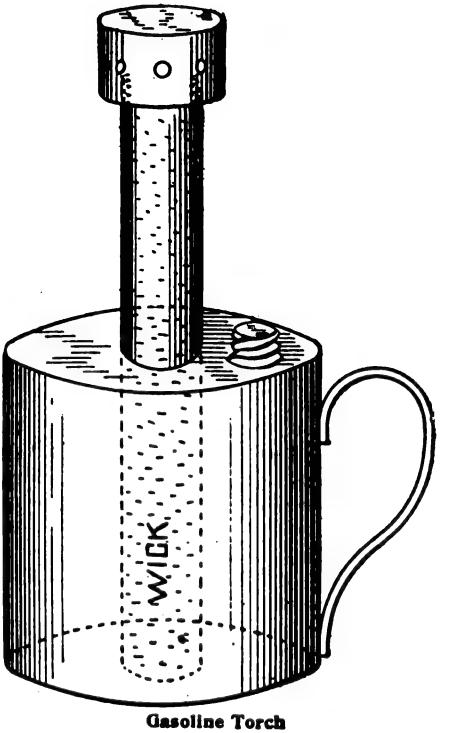
A METHOD OF CLEANING RUSTY PIPE

At the annual meeting of the Pacific Coast Gas Association, in San Francisco, in July, an interesting experience on the cleaning of rusty pipe was described. Some plain and steel tubing for use in high pressure lines came from the factory to the point of shipment on flat cars, and in consequence was badly rusted before it could be gotten under cover. Cleaning machines not being immediately available, a part was cleaned by hand and efficient tools proved a serious problem. Coarse and fine files were not much of a success, because they would not clean out pitted spots and irregularities in the surface of the pipe without removing valuable metal. Emery cloth and sandpaper did not last long enough to make a showing. Steel wire casting brushes proved quite efficient, coarse brushes being used to loosen the larger pieces of scale and rust and fine brushes to work into the pits and clean the dust off. Soft red brick, such as would be used only for filling, and furnace slag were found excellent, the fine particles working into the pitted spots and irregularities as they broke off. The dust left can best be removed by a fine wire brush, leaving the surface of the pipe clean and bright, ready for receiving the paint.

HOME-MADE GASOLINE TORCH

Procure an old tin can, pint size, with a screw top, for holding the gasoline. Punch a hole in the center of the top and insert a piece of ¼ in. gas pipe to within ⅛ in. of the bottom of the can, letting the pipe extend out of the can 4 or 5 in., soldering it in position. Screw a common cap on top of the pipe and drill eight or ten holes around the cap. Fill the pipe with wicking or asbestos.

When ready to light the burner, heat the can on the top and hot gas will flow from the holes. When lighted it will burn as



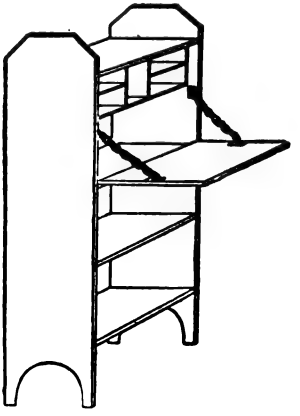
Gasoline Torch

steadily and brightly as gas light. This is a handy torch for use around the shop or outside, as it takes a very strong wind to blow it out.—Contributed by Thiede.

HOW TO MAKE YOURSELF A DESK

In constructing this desk care must be taken in particular to always have the pieces of wood of exactly the right dimensions and cut with square angles. Further than this the work presents no difficulties to one of average ability. Oak is the most suitable wood for the purpose, though white wood makes a nice desk also, says the Engineering World.

Make the side pieces 50 in. long, 12 in.



Home-Made Desk

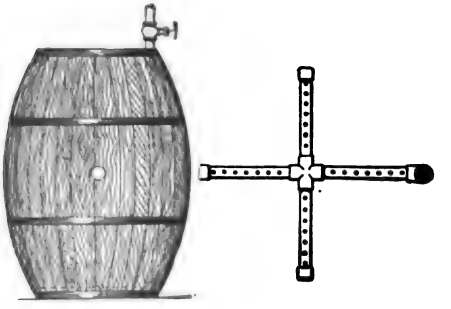
wide and ⅞ in. thick, with curved openings 6 in. high and 8 in. wide at the bottom. Send the sides to the mill to have the pieces cut out, sending a drawing showing what you want done, also. Make the bevel at the top 45° or 3 in. each way. Cut the four cross-pieces from ⅞-in. material 24½ in. long, two of them 12 in. wide for the top and bottom and two 11½ in. wide for the middle. In the top and bottom pieces cut ¾-in. rabbets on the back inner edge for the backing, which should be of ⅛ in. matched stock. Cut grooves ¼ in. deep in the side pieces to receive the cross-pieces. Place the top piece 5 in. from the top of the side pieces, the second cross-piece place 14⅛ in. lower, the third 12⅜ in. lower yet and the bottom piece 10 inches lower than the third piece and 8½ in. above the floor.

Make the partitions for the pigeon holes of ⅜-in. material 10 in. wide, two pieces being 23¼ in. long, two 9 in. long, two 6¾ in. long and two 6 in. long. Nail the two end pieces to the ends of the cross-pieces, then nail the two vertical pieces in place, first nailing to them the ends of the two short shelves. Nail the other ends of the short shelves through the end pieces. Attach this frame to the desk by screws put through from the inside. When the backing is on, further support the frame by a ½-in. square strip screwed to the backing. The backing should be in 36½-in. lengths and may be nailed on with small nails.

Make the drop-leaf from two pieces glued up, 24 in. long by 14⅛ in. wide. Fit a cleat 2 in. wide and ⅜ in. thick at each end to corresponding rabbets cut on the upper side. After fitting and gluing the cleats keep the shelf in clamps until the glue is dry. Attach the shelf to the desk with ornamental T hinges of brass or black iron and put on side chains as shown. Fit a lock to the outer edge and to the inside upper corners of the case glue stop blocks to hold the leaf flush when desk is closed.

WASHING WASTE

Though waste is cheap, in a plant where economy in all branches is practiced, a good method of cleaning it for second use will not be scorned. Save the waste as it is used, allowing it to accumulate in a receptable provided for it. When sufficient is on hand fit up an old barrel with a heating



Waste-Washing Apparatus

coil, says a correspondent of the Engineer's Review, fill it half full of water and, using sal-soda or soap, boil the waste until it is clean. When dry it will be as good as new.

"A wooden floor laid over hollow tile or concrete with not more than ½-in. space between the wood and concrete, burns very slowly, and would have but little effect in feeding a fire."—Kidder.

AN INEXPENSIVE JACK

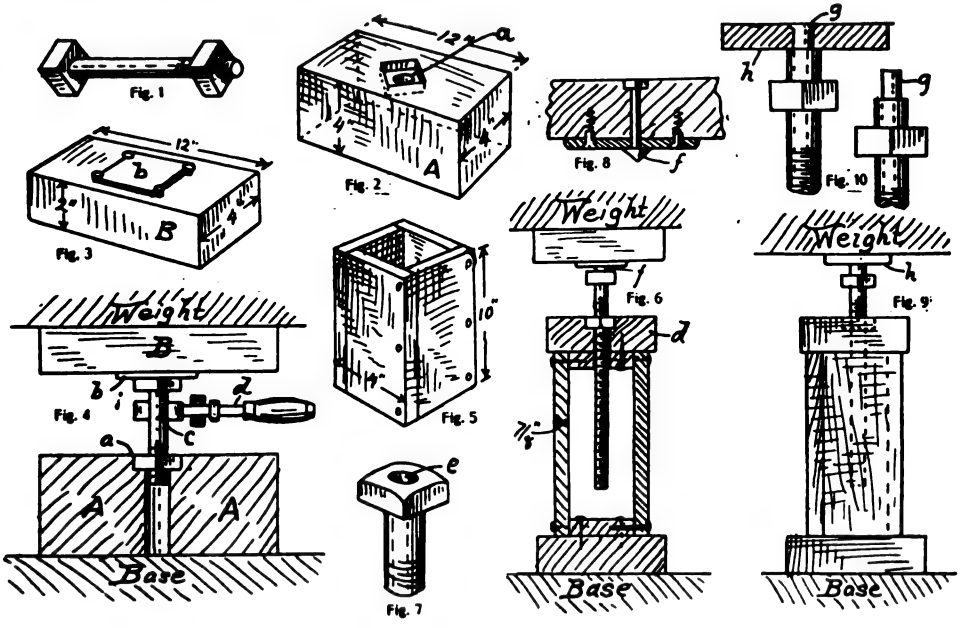
A jack suitable to meet with an emergency may be constructed at a cost of three cents, as follows:

Take an ordinary machine bolt (Fig. 1) any size and length that will bear the weight to be lifted or let down—say, ½ to ¾ in. diameter by 4 in. to 10 in. long. Get a block 4x4x12 in. and bore a hole about ⅛ in. larger in diameter than the bolt through the center; also cut a mortise the size of the nut as at a, Fig. 2. The mortise is to keep the nut from turning.

Get another block about 2x4x12 in. and on one side in the center fasten a plate (b, Fig. 3) ⅛ to ¼ in. thick and 2 to 4 in. square or round. If there are not holes drilled in the plate, fasten it to the block by driving in four or five nails at its edge and allowing the heads of the nails to hook over the edge of the plate.

When blocks A and B are ready, place block A on the base or foundation, setting the bolt and nut in the hole and the mortise, the head of the bolt being up, and put block B with plate b on the head of the bolt on the underside of the weight. (See Fig. 4.) Fit a pipe wrench (d) around the stem of the bolt (c) and proceed to tighten or release as the case requires.

An ordinary bolt is only threaded an inch or so at the point end, therefore only a short lift or release can be made at a time. To raise or lower more than the thread will allow, two jacks of similar construction would hasten matters, using one until the thread is exhausted, then setting the other and using its limit of thread; then setting the first jack again, and so on until the weight is adjusted as required. If only one jack is used it will be necessary to block up for each adjustment. If a long lift or lowering is desired and a tap and die are handy, it would be well to thread the bolt to within an inch or so of its head; this will give a longer movement of bolt. A jack of this description will lift a very heavy load; the writer has one in use that is made out of a machine bolt ¾ in. in diameter and 3½ in. long that cost 3 cents, and which lifts one corner of a house.



A jack for general use can be made at small cost, as follows: Get a machine bolt ¾ to 1 in. in diameter and 10 to 12 in. long. Have it threaded to within one or two inches of the head and make a countersick (e, Fig. 7) in the head of the bolt. Make a square box (Fig. 5) out of ⅞-in. strong, light timber and fasten a block about 2 in. thick by 4 to 5 in. square (d, Fig. 6) at the top of the box. In the center of this block cut a

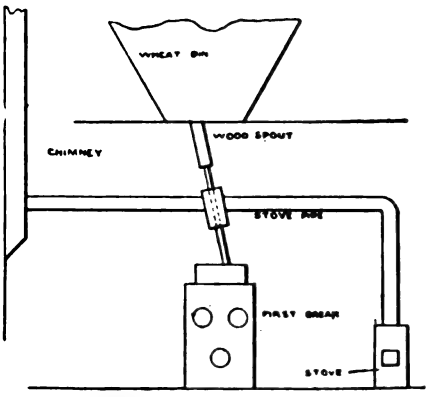
mortise for a nut, as at a, Fig. 2. At the bottom fasten a pasteboard 2 in. thick and 6 in. square. Prepare a block as at B, Fig. 3, fastening the plate in this case with countersunk screws and a bolt with a sharp-pointed head (f, Fig. 8) in the center. This bolt is to set in countersink in head of bolt at e, Fig 6.

A better and more substantial way is to make a screw with a permanent swivel plate, as follows: Have the bolt forged for the purpose. (See Figs. 9 and 10.) Have the square head set about an inch below the point end, then turn down the point end (g) about half its diameter for a distance ⅛ in. longer than the thickness of the swivel plate h. Plate h should be ¼ to ½ in. thick and about 3 to 4 in. square with a hole bored in the center of the same size as pin g and slightly countersunk on one side to make swivel, taking the place of block B, Fig. 3, thus making a cheap and handy jack.—Contributed by C. N. Leonard, 1319 Barth avenue, Indianapolis, Ind.

HOME-MADE WHEAT HEATER FOR A MILL

For the country mill where steam is not used a home-made wheat heater will be found serviceable. The American Miller describes such an installation.

Cut a hole in the middle of a stove pipe

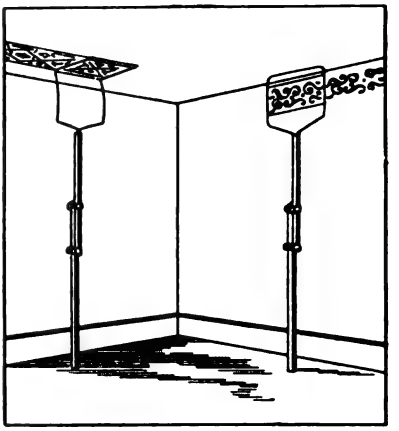


Home-Made Wheat Heater

and join two half links of pipe on each side. Cover the ends of the short pieces with sheet iron, making an opening in each large enough to admit a 2-in. gas pipe. Run the gas pipe from the wooden spout at the wheat bin, through the hot air chamber so made to the rolls. The stove pipe, of course, runs from stove to chimney. Keep up a good fire in the stove and the wheat as it moves through the gas pipe will be put in good condition for grinding.

CONVENIENT STENCIL HOLDER

For applying stencil decorations a new stencil holder, a recent invention, will be found convenient. The device holds the stencil in working position against either a

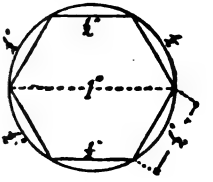


Stencil Holder

side wall or a ceiling while the pattern is being reproduced upon the surface against which it rests. The holder is adjustable to any height within its limit and is also collapsible, making it convenient for transportation from one job to another.

TO DRESS UP A HEXAGON

Turn the work round in the lathe, caliper the diameter and file a flat on round equal to one-half the diameter. File the next side of the hexagon in the same way, and let the edge of this flat just reach the edge of the first flat. Proceed in this way until the eight sides are filed. If carefully done the work will come out exactly as shown in the sketch.—Contributed by F. A. Sustins, Stevens Point, Wis.



Life subscriptions to Popular Mechanics, $10, or, sent five years for $3.

TO FIREPROOF PAPER

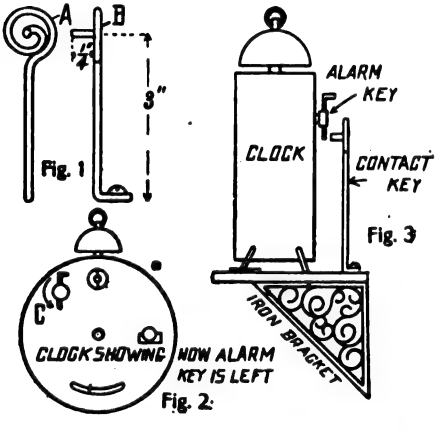
By immersing paper (plain, printed or written on) in a strong solution of alum water and then drying it, the paper will be made fireproof. Some paper, however, requires several immersions and must be immersed and dried until saturated. Test by holding saturated paper in the flame of a lighted candle. Money can be fireproofed in this way.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.

CONNECTING UP AN ALARM CLOCK TO RING AN ELECTRIC BELL

Construct a shelf 6 in. x 4 in. of any hardwood. Get a strip of thin brass 4 in. x ¼ in. Bore a small hole ¼ in. from each end to admit a small round-headed screw. Screw the brass strip 1¼ in. from the front edge and 1 in. from each side of the shelf.

When this is completed make a contact point out of a piece of No. 16 iron or copper wire about 4 in. long. Bend one end of this wire in the shape shown at A, Fig. 1, so that ¼ in. of the end at the center of the coils will project at right angles to them. Bend the other end of the wire so that it can be fastened to the shelf. Fasten this contact point 2 in. from the brass strip and 2¾ in. from the right hand side of the base. The distance from the center of the coiled part to the base should be 3 in. B, Fig. 1, shows a side view of this part.

Remove the alarm key from the clock, and

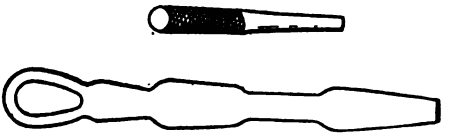


if it has square corners cut it so it may be bent in the shape shown at C, Fig. 2, if it is round fasten a piece of No. 16 wire, bent in the shape indicated at C, to it, using wires to hold it in place.

Connect one wire from the electric bell to one of the screws in the brass strip and connect the other wire to the contact point. Set the clock on the shelf with the front legs resting on the brass strip and so the contact point is a little to the right of the set key. The clock may be taken down to wind, and in winding the alarm only one turn is necessary. Leave the bent part of the key pointing upward so that when the alarm goes off the key will turn downward, striking the contact point and closing the circuit, remaining so until someone comes to move the clock, and stop the ringing. The advantage of this method is that there are no connections to loosen when the clock is taken down to wind.—Contributed by R. M. Taylor, Cincinnati, Ohio.

HOME-MADE SCREWDRIVER AND NAIL PUNCH

A good screwdriver can be made out of an old flat file about 8 in. long by grinding it smooth on both sides and on the edges



Home-Made Screwdriver and Punch

to the shape of a screwdriver. One of these screwdrivers after a year's use is as good as when first made.

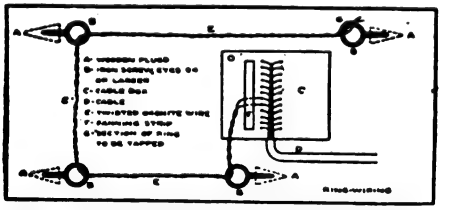
A nail punch may be made of an 8-in. rat-tail file by taking a piece 4 in. long out of the middle and grinding the point half smooth and leaving the other half as it is.—Contributed by Edgar Robertson, Castleton, N. Y.

LINSEED OIL AS FLUX IN TINNING ROOFS

Tin roofs need have absolutely no preparation previous to painting, if the tinsmith uses linseed oil for a flux. The oil is not quite as rapid as rosin or acid, but it leaves nothing objectionable to be dealt with afterwards. Acid will run into the seams and cause corrosion, while rosin is extremely hard to remove, especially from pits and irregularities in the surface.—Contributed by James H. Beebee, Rochester, N. Y.

RING WIRING AND DISTRIBUTION

Circuit distribution in closely built districts is a problem which differs largely from that encountered in suburban or rural localities. The most improved method utilizes a scheme called The Block, says the American Telephone Journal. In the center of blocks consisting of the area enclosed within four streets, terminal boxes are installed. From there the twisted pairs are run through rings fastened to fences or



Ring Wiring, Showing Details of Installation

walls, and in this manner distributed to the subscribers' stations. The cable leading to the terminal box is brought in underground and the box placed in a dry cellar to which access can be readily secured at all times. The supports employed for this method of distribution consist of iron screw eyes or rings not smaller than No. 4, and of sufficient size to allow all the present and prospective lines along any route to readily pass through them without binding. These supports should be covered with an insulating enamel which not only adds to the resistance of the line in damp weather, but also prevents to a large extent any chafing of the insulation when the wires are pulled in.

These rings are shown at B in the accompanying illustration. In placing them, if in brick or stone, the hole should be drilled and a wooden plug driven in to give a sufficiently strong holding point for the screw thread. Insulated rings should never be driven in, as by so doing, the enamel will be cracked off, destroying its insulating quality, and also forming a rough surface upon the ring which will wear away the insulation upon the wire. For turning corners, rings with angle irons in place of the screws should be employed. Where the line route is along fences no trouble will be experienced in screwing the eyes to the woodwork. At the final ring where the twisted pair leaves the run to enter a subscriber's premises, it should be tapped off as shown at G. This gives additional strength to the circuit and prevents the wires slipping.

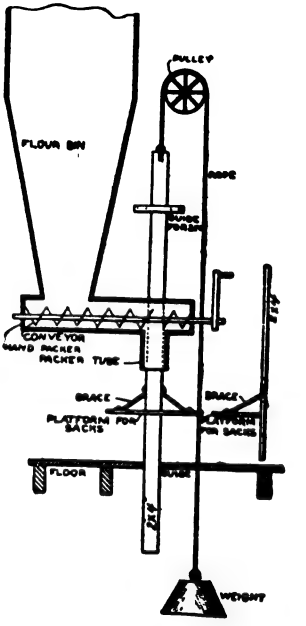
This method of distribution is sightly and affords excellent protection to the circuits in cases of storm, by holding them close to the building or fence, which acts as a shield against the wind.

SAND THE SECOND COAT OF PAINT

If the second coat of paint is well sanded with fine sand, it will not need to be painted again in twenty-five years, writes James H. Beebee, of Rochester, N. Y. Use seashore sand, well washed and freed from all impurities.

HAND-PACKER FOR SACKING FLOUR

The accompanying sketch shows a handy packer for sacking flour by hand. There is little to explain in the sketch, as anyone can see at a glance all that is required to make it. It can be put on any hand packer, says American Miller.



Hand-Packer for Sacking Flour

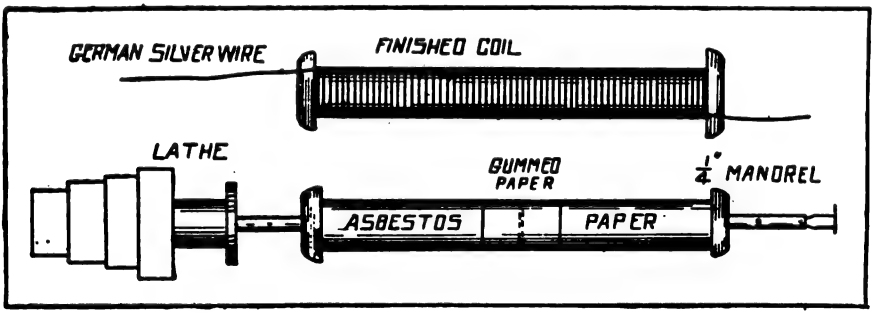
It can be made by anyone, and all that is required is a 2x4, a rope, rope pulley and weights to little more than counterbalance and draw up the sack platform.

METHOD OF WINDING COILS

In replacing some burnt-out coils in a controller I hit on the accompanying kink, writes O. N. Tait, electrician, Mountain View, California:

In a piece of ¼-in. iron 12 or 14 in. long drill two holes, one near each end. Over this rod slip two common bushings, such as are used to go through walls. Have the heads of the bushings away from each other, and use gummed paper to hold the ends together. Then with a piece of asbestos paper take one turn around the tubes, holding this in place with gummed paper also. Put the work in the lathe and wind on the wire its own width apart. Cut off the wire and put the other end in the other hole. Then take the work out of the lathe and place in a gas flame, turning it once, until the wire is red hot all over. Allow to cool slowly; by doing this the wire may finally be cut off without danger of its unwinding. When cold coat with shellac. Knot the ends of the wire and you will have a coil that is noncombustible and can easily be removed from the mandrel.

I have a set of these coils in a controller on a huge rotary press and they have given good service under hard usage.



Good Coil-Winding Method

TO FIND HOW MUCH GRAIN ANY BIN WILL HOLD

For finding how many bushels of grain any bin will hold try the short cut of multiplying the length, breadth and height in feet together and then multiply by 0.8. The result will be the number of bushels the bin will hold. This rule is shorter than the old rule, says the Grain Man's Guide, and is accurate.

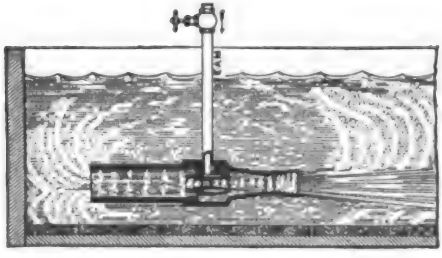
HOW TO PRESERVE POSTS

Wood can be made to last longer than iron if treated according to the following directions, writes Anthony Haselman, 80 Morton street, Newark, N. J.:

Into boiled linseed oil stir pulverized coal until the mixture is of the consistency of paint. Put a coat of this over the timber, and there is not a man living who will see it rot.

HOW TO HEAT LARGE BODIES OF WATER

Large volumes of water, such as contained in swimming tanks, etc., can be rapidly heated by means of the arrangement shown in the illustration. It consists of an ejector having space for steam around a central tube through which the water passes. The steam is turned on and rushes out of the concentric opening, drawing the water after it. One hundred gallons of water can be raised 50 degrees in three minutes in this way with only a ½-in. steam connection, and a 1½-in. water inlet, or in one minute with a 1-in. steam pipe and a 2½-in. water opening.

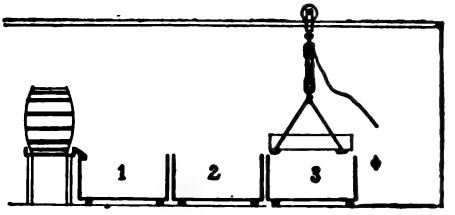


Heating Large Bodies of Water

HYDROFLUORIC ACID vs. SULPHURIC ACID FOR PICKLING CAST IRON

By F. W. Hobbs, Electroplater.

The use of hydrofluoric acid for pickling cast iron preparatory to polishing and plating marks a great stride in the reduction of cost and quality of work produced. The old method of pickling with sulphuric acid was very unsatisfactory at best; in spite of the various alkali baths used after pickling, the work nearly always behaved badly in the nickel path, owing to the acid remaining in the pores of the iron, and the result was a dark unsightly deposit, especially in the backgrounds or unpolished surfaces, and a contaminated solution. Suppose a plain surface is to be pickled: If the sand is burned in in patches, which is often the case, the acid must work its way under the



Apparatus for Pickling Castings

sand, dissolving the iron, thereby freeing the sand; at the same time the acid is going much deeper into the exposed places where there is no sand; result, an uneven surface requiring extra work to grind it even again.

Hydrofluoric acid has very little effect upon iron, but dissolves sand very freely and therein lies the secret of its superiority. Its use results in a smooth grey casting free from sand and scale, and one which, when rinsed and soaked for ten or fifteen minutes in lime water, will grind easily and come out of the nickel bath a perfect white, and the condition of the solution will not be affected in the least. After using hydrofluoric acid for two years, I can positively say that the use of sulphuric acid for pickling is simply a loss of time and material as compared to hydrofluoric. Hydrofluoric saves emery, glue, wheels, solution and time and produces a far better class of work than could be had by the use of sulphuric acid or no acid.

A convenient method of using the acid is shown in the accompanying sketch. At the left is a bench a trifle higher than top of the tanks. On this bench is a shallow lead tray large enough to permit the barrel of acid to be stood in it. A small lead pipe leads to the first tank, which should be lead-lined with seams burned, not soldered. This tank is to contain the acid, one part to fifteen parts of water. Tank No. 2 is for clear water, and Tank No. 3 for hot lime water. The lime water can best be heated by inserting a coil of steam pipe. Above the tank is a track with a set of small falls connected to a truck on the track. The cage or car is made of soft wood doweled together with wooden dowels and slung from falls by an iron strap sheathed in lead pipe. The cage is first loaded and lowered into tank No. 1, then raised, run along the track and lowered into No. 2, then up and along and into No. 3, then up and run back and lowered on to pieces of scantling placed across No. 2, where it may dry by the heat caused by the hot lime water. Have two or more heavy hoops made and rolled in hot lead, and when a barrel of acid is received, place the hoops on as a protection, should the acid find its way through the pitch lining and attack the slender hoops on the barrel. Put a strap on the barrel and raise it into the tray, then puncture the side near the lower head with a nail in such manner that when the acid runs out it will strike in the tray and be conducted to the tank by the small lead pipe. When the proper amount has been drawn off, stop up the puncture with a wooden plug. Should this leak a little or should the joints leak a little, the acid will be conveyed by way of tray and pipe to the tank so none will be lost. When the barrel is empty it may be lowered and the heavy hoops knocked off for use on the next barrel.

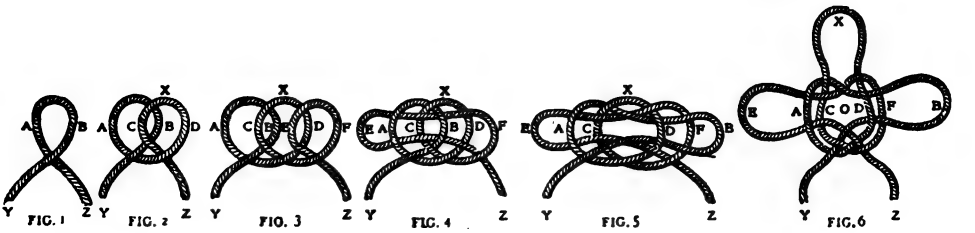
The acid is shipped in pitch-lined barrels or lead-lined carboys; the carboys soon become leaky, owing to rough usage in transportation and are expensive; therefore, I recommend that the barrels be used for transportation.

MADE A WASHER OF A KEY

While looking for a washer, which I failed to find, I ran across an old brass key with a round ring at the top and flattened at both sides. Using a cold chisel, hammer and file I cut the ring off, then filed it perfectly round. It worked like a charm for the water faucet.—Contributed by W. A. Perry, 74 Orange street, Brooklyn, N. Y.

HOW TO TIE A JURYMAST KNOT

This knot is also known as a masthead knot and a bottle hitch and is used at the top of a temporary derrick in place of a mast iron to fasten the guys to. A correspondent of the American Machinist tells how to tie the knot.

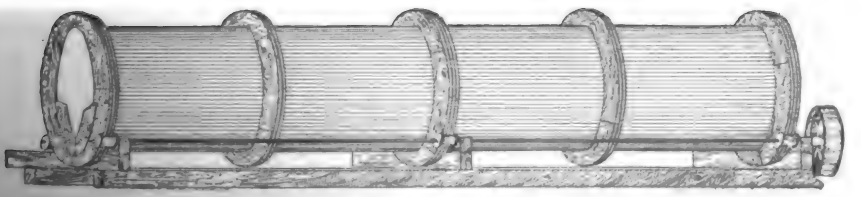


Take a piece of stout cord and hold it between the thumb and forefinger of each hand with a space of about 6 in. between the hands. Then twist the cord right-handed with the thumb and forefinger of the right hand only. This will throw up a "bight" like Fig. 1, with the part A under B. Grasp the loop thus formed between the thumb and forefinger of the left hand at the point where the two parts cross. Then move the thumb and forefinger of the right hand along the cord about 6 in., and throw up another "bight," laying it on top of the first one. You then have Fig. 2. Hold these two bights with the left thumb and forefinger, measure off another 6 in. and throw the last "bight." Place it on top of the last one made and you have Fig. 3. Take the part E in the last bight at Fig. 3 and—while holding the other parts in place—pass it under B, over C and under A. This makes Fig. 4. Then take B, Fig. 4, and pass it under D and over F. The result is Fig. 5. Then, while holding E in the left and B in the right hand, take hold of X with the teeth and pull it. The result will be Fig. 6. In practice the part O in Fig. 6 goes over the reduced part of the mast or derrick head. The forestay is made fast to X. The stays to E and B. Y and Z form the back stays. Any strain on the stays tightens up O. By pulling Y and Z in opposite directions the knot comes out. Every workman should know how to tie this knot.

PIPE-CLEANING MACHINE

A machine for freeing pipe of oil and rust preparatory to painting, consists of a wooden drum, 4 ft. in diameter and 22 ft. long, which is worked at about ten revolutions per minute, says the Journal of Electricity, Power and Gas. The pipe to be cleaned is placed in the drum and nearly covered with clean, sharp sand. Sand is added as required after the first charge.

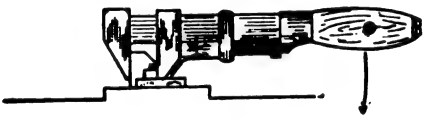
There is enough pipe for one time in the drum when the top piece drops and rolls over the other pipes, about one each turn, or so. If it drops too often, remove one piece at a time until right, or if it drops not at all, add pipe until it does. This method will clean the pipe bright inside and out. All the cost is for power to run the machine and help to handle the pipe.



Wooden Drum for Cleaning Pipe

REMOVING KEYS FROM VALVE STEMS AND SHAFTS

While adjusting a high duty pumping engine with Corliss valve motion, I frequently found it necessary to remove the



Removing a Key

keys from the valve stems. Most all keys are driven in to stay and it is no easy matter to start one without breaking off the head or bending the key, but by means of the following wrinkle I found it quite easy to remove most any key.

Place a monkey wrench on the head of the key as in the illustration, and drive a chisel or wedge between the head of the key and the stem, or the shaft, or whatever it may be. While driving, press against the handle of the wrench.

The wrench puts an even strain on the key and also keeps the wedge or chisel in place. Squirting kerosene oil around the key will also aid in extracting it. I learned this scheme in a machine shop where it was used to remove sprocket wheels keyed on the ends of shafts.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.

SAID TO CURE FELON

A very simple cure for a felon is given in the Medical Visitor by Dr. Whitman. The doctor says that for the last fifteen years he has used egg to cure felon, and has yet to see a case it will not cure. The way to apply the egg is as follows:

Take a fresh egg and crack the shell at the larger end. Make a hole just large enough to admit the thumb or finger, whichever it may be, and force it into the egg as far as possible without rupturing the shell. Wipe off the egg which runs out and bind a handkerchief or soft cloth around the finger or thumb, leaving the egg on over night. This will generally cure in one application, but if not make another application.

White spots on polished furniture, caused by hot dishes or alcohol, may be removed by the use of spirits of camphor.

HOW A GAS ENGINE TALKS

To the experienced man the gas engine has a language of its own which the man who runs it must at all times understand, says Gas Power. If he cannot do this then his experiences with the engine are going to be varied, but they won't be pleasant. When the engine is right and is, in consequence of being so, doing what is right, the only sound it emits are such as are made up from the clicking of the valves, the inhalation of the air and the exhaust. When the usual sounds are well understood, any unusual ones will be promptly noticed and their cause located and removed. The trained ear is probably a better trouble detector than the eye. The best way to become acquainted with the natural sounds is to first operate or run the engine for a time, say from a half to an hour, free; without a load.

It will be noticed that under no load, besides driving itself, if it is a hit-and-miss governor engine, it will produce an inhalation sound followed immediately by a loud exhaust report. If the governor is the least bit off or sluggish a second or third of this pair of sounds may follow in quick succession. But usually the first is followed by an intermission, which is made up of a series of suction sounds at the end of the exhaust pipe, if the governor serves to hold up the exhaust valve when no impulse is needed. These suction or blowing sounds are due to the inhalation and expulsion of the air through the exhaust pipe, at each movement of the piston, so long as the governor holds up the exhaust valve. The moment this valve is released a loud suction or inhalation sound is again heard at the mouth of the receiving pipe, followed immediately by the loud report at the end of the exhaust pipe, which pair of sounds is the result of taking into and igniting the charge within the cylinder and exhausting the burnt gases under the pressure that remains in the cylinder at the time the exhaust valve opens.

Now, if the inhalation sound at the receiving pipe is heard and the loud exhaust report does not follow, the operator knows at once that the charge taken during the inhalation was not ignited or exploded. He knows there is a natural sound missing which signifies an abnormal condition. He reasons, if the charge isn't exploded, why not? Did the gasoline fail to get into the air current in sufficient quantity to make

the proper mixture? or did it overcharge the air? or was the mixture right and did the battery fail to make a spark? or if proper mixture and spark were both present, is there a leak of sufficient gravity through the valve or around the piston, by the packing rings, to allow practically all of the charge to escape before the spark is made?

The absence of a natural sound production will often point out an abnormal condition as readily as the presence of an unnatural one will. A careful operator notices all of these things. None of them escapes his ears so long as he is within hearing distance of his engine. To him the absence of one natural sound is the letter that misspells the two words, successful operation, consequently the importance of being able to detect the absence of the natural sounds. To know them is the only sure way to notice their absence.

The frequency of the exhaust reports increase as the engine is put under a load. And the heavier the load the more frequent the reports, until a full load is reached. A trained operator can be away across the country and within hearing distance of his engine, or rather the exhaust reports of it, and be able to say that the engine is running well and easily carrying its load, or that there is something wrong with it.

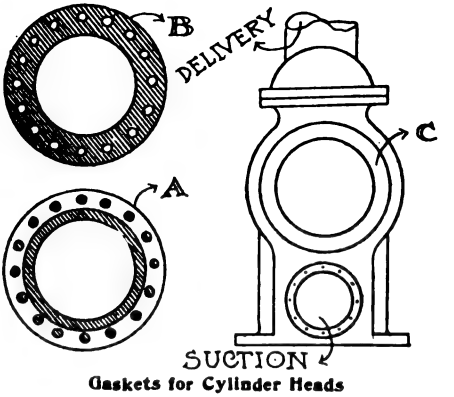
Now, one of the common expressions of discontent the engine makes is pounding in the cylinder; and this usually occurs when the engine is under a heavy load. The interior of the cylinder gets so hot that some burnt carbon or projecting point of iron becomes heated to the igniting point. This in connection with the heat generated by the compression pressure ignites the charge before the piston has completed its compression stroke. The result is a sudden conflict between the explosive and compression forces. This sudden collision of forces causes a heavy pound in the cylinder. A loose flywheel causes a thump, usually at every impulse the engine takes. Looseness at the wrist box causes a knock. A loose crosshead box usually causes a clatter. A knock once located around the connecting rod may be due to either the crosshead or wrist boxes being adjusted too tightly. One may be so tight as to lift and depress the other end at each revolution. Often a knock or clatter at the crosshead or wrist bearing may be cured by simply loosening up the bearing or box at the other end of the connecting rod from that where the knock is located.

A flywheel loose on the shaft sometimes makes a rubbing sound, caused by some part of the circumference of the rim of the wheel rubbing at each revolution against some object near the engine. There is a barking or coughing noise at times from the cylinder, due to escape of the explosive force past the piston rings. This seldom occurs unless rings are badly worn or poorly fitted to the piston. Sometimes gummy oil will cause rings to stick in their grooves. A blowing noise just in advance of the exhaust report at the mouth of the exhaust pipe indicates a leak at the exhaust valve.

GASKETS FOR CYLINDER HEADS

Cylinder head gaskets sometimes have a frayed or chewed appearance after being in use a short time, due to a breathing action or movement of the cylinder head outward, which action permits water to escape between the gasket and head.

If a gasket similar to the one shown at B in the illustration is made, treated to a



Gaskets for Cylinder Heads

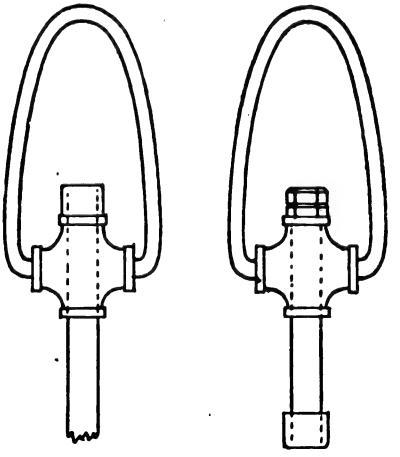
coating of graphite and cylinder oil and inserted in place, a water-tight joint will result, says the National Engineer, even though the breathing action of the cylinder head continues. The method of applying the gasket is shown at A.

Varnish should not be thinned with turpentine, says the Master Painter. It reduces the gloss and if the turpentine has been adulterated with mineral oil injures the varnish.

Shop Notes for 1906 will be ready December 1st Price, 50 cents.

A ROPE SWIVEL FOR A WELL DRILLER

Take a 1¼-in. cross and run a 1-in. nipple through from top to bottom. Screw 1¼-in. pipe in the top and saw off flush with cross



Making a Rope Swivel

for swivel surface. Screw two lock nuts or one old coupling on the top of the 1-in. nipple and a coupling on the bottom for a 1-in. drill rod. Bend a piece of ¾-in. solid iron to the required shape for a ball and put the ends in the sides of the cross as shown in the illustration.—Contributed by N. G. Hall, Parker, S. D.

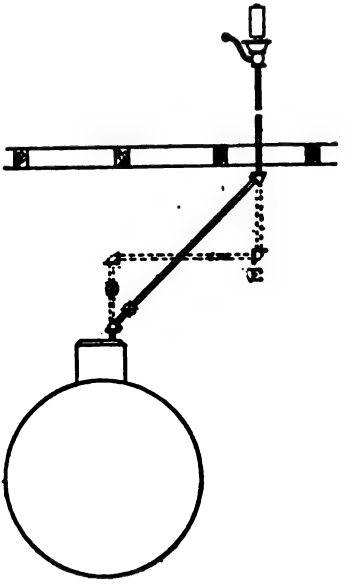
HANDY BOX RACK

Any one who has a large and varied collection of small stuff such as nuts, bolts, screws, washers, etc., will find a handy method of keeping them by using old cigar boxes. A label should be pasted on each box naming the contents. Then by using long nails driven into the wall above the bench the boxes can be arranged in a convenient order. The plan saves both time and supplies, besides giving a greatly improved appearance to the place.

A mixture of 1 part pitch, 1 part resin and 1 part plaster of paris is said to be a good cement for coating acid troughs.

HOW TO REMEDY A "SQUEAKY" WHISTLE

In a plant where the whistle squeaked it was found that water settling in a corner of the piping (E in the sketch), caused the trouble. A plan of the old piping is shown by the dotted lines in the sketch. To remedy the trouble two 45-degree elbows and two nipples were used as shown so that there was no pocket for the water to settle



To Keep a Whistle from Squeaking

in, says the Practical Engineer. Others annoyed in this way, may, on investigation, be able to apply a like remedy.

Weak sulphuric or hydrochloric acid in the proportion of one part of acid to six to ten parts of water is excellent for removing efflorescence from artificial stone. Scrub the facing of the stone with the liquid thoroughly.

To harden plaster of paris quickly, add powdered alum to the plaster water. This is better than salt for the purpose.

SHOP NOTES

PROPER METHOD OF USING SANDPAPER.

Of a piece of mahogany or clean pine about 5¾x3x1 inch make a rubber shaped as in Fig. 1 and glue a piece of sheet cork on the face of the rubber. Fold into three a piece of sandpaper 6 inches wide and 10 inches long and place the face of the rubber on the middle division, the sand side of the paper being downwards. The rubber should be grasped firmly, the ends of the sandpaper being held on its back and sides, as in Fig. 2, and then the work may proceed. This method is recommended by Fred T. Hodgson in his New Hardwood Finishing.

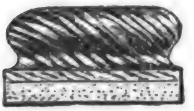


Fig. 1

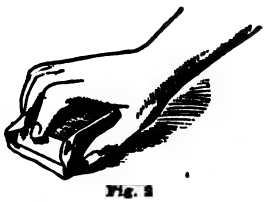


Fig. 2

Another method of making the rubber block is by glueing a piece of rubber belting to a piece of basswood, or a solid rubber about one inch thick may be used.

SOME GOOD PAINTS FOR STACKS AND BOILER FRONTS.

A good paint for this purpose is asphaltum cut down with turpentine to the right consistency; coal tar mixed with graphite and thinned with turpentine is good, also.

Steam pipe used for heating, says a correspondent of the Engineer, should not be painted, but can be given a thin coat of lampblack and linseed oil, which will greatly improve its looks.

A SIMPLE FIRE EXTINGUISHER.

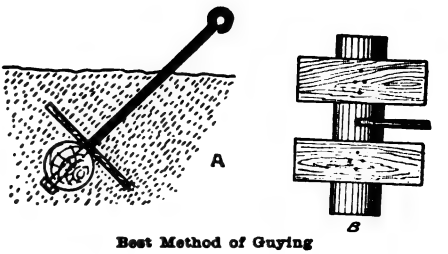
A fire extinguisher easily made and ready at all times for instant use consists of a gallon of water to which is added three pounds of salt and one and one-half pounds of sal ammoniac. Bottle this liquid and when fire breaks out pour it on.

A HANDY CONCRETE FORMULA.

There are a great many formulas and a great many estimates for the cost of concrete, and here is another. A gentleman, who has had some experience, says that good concrete can be laid for about $2.00 to $2.25 per yard. Cellar floors and sidewalk can be laid down, furnishing everything for 12 to 14 cents per square foot super. Foundation work: One part of cement, three parts of plain sharp sand, six parts stone or broken brick so as to pass a 2-in. ring, properly moistened will make a good strong foundation.

THE BEST METHOD OF FASTENING GUY LOGS.

In setting poles, says the American Telephone Journal, guy logs should be placed so as to offer the greatest resistance to the strain. The illustration shows the best



Best Method of Guying

method of doing this. To the guy log, B, are fastened two crosspieces as shown, the rod passing through the center of the log and fastened with a nut (Fig. A). Its position is clearly shown in the sketch.

The quantity of pure platinum produced in this country during 1903 was 110 ounces, valued at $2,080. This does not include $6,000 worth of platinum reported as contained in slimes from copper ore from a Wyoming mine. This is an increase of 16 ounces over 1902, but in 1901 the production was 1,408 ounces of refined metal. For two years the average price has been $19 per ounce.

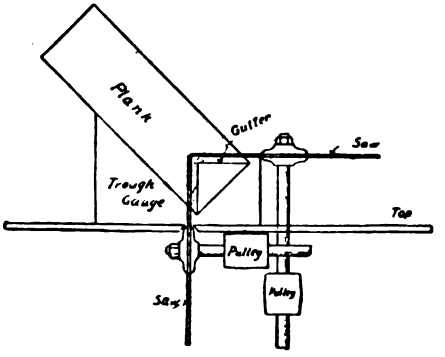
USE OF MURIATIC ACID IN COPPERING STEEL OR IRON.

A few drops of muriatic acid will make copperas take hold of the metal in coppering a surface of steel or iron to take scratch marks, even though the metal be oily. It is not necessary to wait for it to dry; merely wipe off all surplus acid with a rag.

DEVICE FOR CUTTING WOOD GUTTERS.

Ordinarily gutters are cut on a rip saw with one saw and by turning the stock around. The machine for making wood gutters shown in the sketch is a device of a correspondent of the Wood-Worker and by means of it gutters can be cut in just half the usual time.

It is a combination of two saws, one



Device for Sawing Wood Gutters

upright and one horizontal, so that the two cuts can be made at one time. When a plank is started all that is necessary is to return it, repeating the operation. Each time the stock passes over the machine one gutter is made, and the operation is continued until the plank is used up, the only waste being the saw kerf and the corners. The same rig can be attached to a self-feed rip saw and the stock fed by power.

HOW TO CANVAS A BOARD CEILING.

When canvasing a ceiling on which to hang paper, the strips of canvas should first be stitched on the machine into a sheet the size of the ceiling, making each seam about one-half inch, says the Master Painter. The sheet should then be rolled on a pole and the outer edges tacked.

The cloth can be put on so that all the tacks are on the inside and do not show. To do this unroll the cloth a foot beyond the first seam and have an assistant hold the roll back out of the way. Grasp the seam betwen the thumb and finger and stretch the first strip and drive tacks one-fourth of an inch outside the stitches through both thicknesses of the cloth as lapped together to make the seam. Proceed in this manner with each seam in its turn until the ceiling is covered, then stretch and tack across the other sides of the room. The side of the cloth which shows will be stretched clean and smooth and the quarter inch between the seam and the tack will let the cloth give and take as the boards shrink or swell and thus keep the cloth from sagging. This method of putting on cloth is called blind tacking. Unbleached muslin should be used.

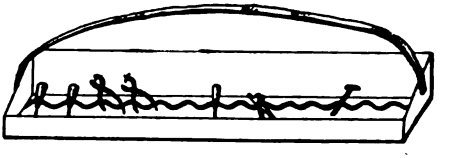
POLISH FOR HOT METAL.

The following polish for hot metal is highly recommended by a correspondent of the Engineer:

Take the ash of anthracite coal from under the grate bars and shake through a fine sieve, then use kerosene oil and mix into a good paste. Use any kind of cloth, and apply this to your cylinder heads and rub very hard. Always rub with the grain of metal so you will not scratch it. Leave the paste on until dry, then use a dry cloth and polish it to suit your taste.

TOOL BOX FOR MILLERS.

For millers or in any trade where such tools as a claw hammer, tack hammer, belt punches, spring punches, screw driver, wire cutter and any number of other small tools are in constant demand the tool box shown in the sketch is especially handy, as the full



Handy Tool Box

outfit of tools can be carried from place to place or from one part of the plant to another, saving delay and trouble. The box should be from 2½ to 3 ft. long by 8 in. wide at the top. says the American Miller. The sketch explains the construction.

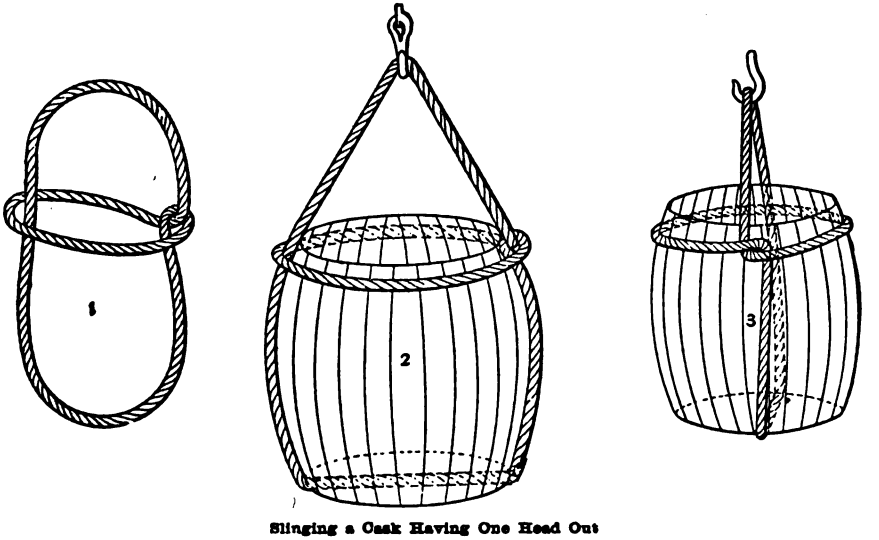
ECONOMICAL METHOD OF GETTING UP STEAM IN AN EXTRA BOILER.

Starting up an extra boiler a couple of times a week for a few hours only naturally would consume a great quantity of coal to get up steam from cold water. A correspondent of Power who faced this difficulty tells how he got around it and had a supply of hot water ready for emergencies also, he says:

"I put a tee on the blow-off pipe and took a branch to the suction of my boiler feed pump, and before starting up would circulate that water in the boiler through my feed water heater into the front head of the boiler and back again for about an hour, thus warming the water up with the exhaust steam from the engines. This also prevented sudden strains on the boiler, due to getting steam up quickly from cold water."

HOW TO SLING A BARREL.

It is sometimes necessary to sling a barrel containing small castings and liquids and with both heads on it is an easy job, says the American Machinist, but with one head out, the average workman handles it very awkwardly and uses a great deal of rope in lashing it. Our sketch shows how it may be done with an ordinary sling and in the simplest manner possible.



Slinging a Cask Having One Head Out

FIRST THING TO DO IN CASE OF ACCIDENT.

Keep cool. Summon a surgeon at once. Send a written message, describing the accident and injury, if possible, in order that the surgeon may know what instruments and remedies to bring.

Remove the patient to a quiet, airy place, where the temperature is comfortable, but never to an engine room, and keep bystanders at a distance. Handle the patient quietly and gently.

Arrange the injured person's body in a comfortable position; injuries to the head require that the head be raised higher than the level of the body; when practical, lay the patient on his back with the limbs straightened out in their usual natural position. Unless the head be injured, have the head on the same level as the body. Loosen the collar, waistband and belts. If the patient should be faint have his head rather lower than his feet. If the arm or leg be injured, it may be slightly raised and laid on a cushion or pillow.

Watch carefully, if unconscious.

If vomiting occurs, turn the patient's body on one side with the head low, so that the matter vomited may not go into the lungs.

If a wound be discovered in a part covered by the clothing, cut the clothing in the seam. Only remove sufficient clothing to

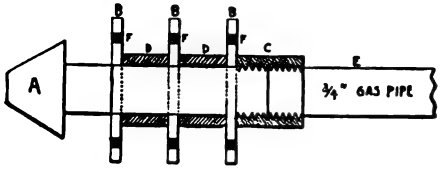
uncover and inspect the wound. In case of burns, pour lukewarm water containing a little baking soda over the clothing before attempting to remove it. All wounds should be covered and dressed as quickly as possible. If a severe bleeding should occur, see that this is stopped, if possible, before the wound is finally dressed. Do not touch the wounds with the hands either during examination or while applying dressings, unless they have been previously made surgically clean. After dressing a wound, do no more to the patient unless necessary to restore him to consciousness or relieve faintness.

If suffering from shock, place him in a comfortable position and await the arrival of the surgeon.

CLEANING CLOGGED PIPES.

The device shown in the sketch is a tool used by a correspondent of Domestic Engineering for cleaning pipes which have become clogged by a deposit of mud.

The tool is made up of a solid bolt of iron, with a conical-shaped head, A, the



Tool for Cleaning Clogged Pipes

point being moderately sharp for driving with a mallet. Washers, B, of not more than 2¼ inches diameter are slipped over the bolt and kept in position by sleeves (D) cut from gas pipe slightly larger than the shank of the bolt. Not less than four holes should be bored in each washer, as at F, to let the water pass and carry out the mud cut loose by the cleaner.

If the joints are properly made up the ¾-inch pipe is best, as it does not weigh as much as the 1-inch and two or three men can handle more feet when cleaning. Bolt A should be about 2 inches between head and the coupling; this enables one to hammer loose if the cleaner should become fastened.

To operate, take the tool and insert at the discharge end of the pipe. First connect on length of pipe, shove and pull until this length gets too short, then add another, and so on up to the limit of your power. With four men over 300 feet in a stretch can be cleaned. Then draw out your cleaner, measure along your pipe line to point it reached, dig out two or three lengths, cut the coupling nearest the discharge, raise the pipe gradually until the free end is above the trench, add a length so as to carry the water away from your pit; then start and work your cleaner as at first, and repeat until the entire line is clean. Bear in mind that each time you cut your pipe the water must be cut off until you are ready to start the cleaner; never attempt to use it until the water is flowing.

REPAIR FOR A CUT JOURNAL.

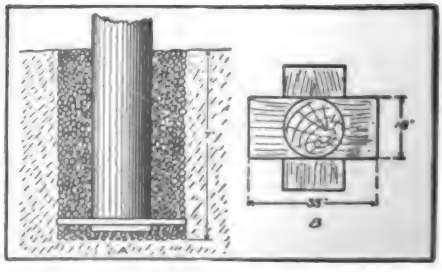
For a hot brass in a locomotive that has cut the axle the following method of treatment is recommended by one of our readers, Harry A. Tradsham, foreman of the Canada Eastern Ry. shops at Gibson, N. B., Canada. He says:

Remove the brass and tin it all over the wearing surface and then drop little daubs of solder all over the tinned surface. This will be found a sure cure for a badly cut journal.

SETTING POLES IN SOFT GROUND.

An excellent method of setting poles in soft ground without sinking them in is given by the American Telephone Journal. It says:

Set the pole in a concrete envelop composed of rubble; one part cement, two parts



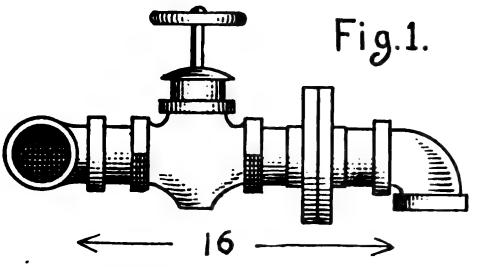
Setting Poles in Soft Ground.

sand, and four parts stone. To the bottom of the pole a platform should be attached, as shown in the figure. This eliminates all possibilities of the pole sinking and at the same time the use of the concrete secures a foundation which has a great amount of stability.

SOME PIPE PROBLEMS SOLVED.

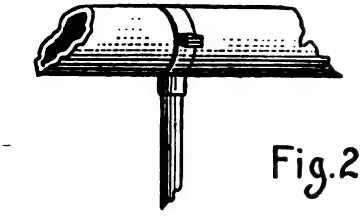
The following kinks, which may be of practical benefit to other workmen, were given by T. F. McMackin in the Engineer:

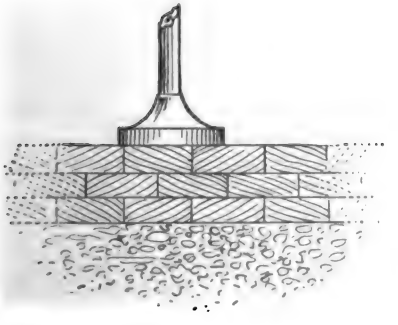
Fig. 1 represents a difficult job of pipe-



fitting recently done on some boilers installed in New York. The boilers were divided into two sections or batteries, one section being placed in a vault or fire-room directly under the sidewalk, and contained two boilers, one placed on the right of the building. The boiler on the left had just been installed and the steam cut off from that side of the building, the main being kept hot from the boiler on the right, which made it necessary to make connections after 12 o'clock Saturday night.

The mains were 4 inches in diameter and

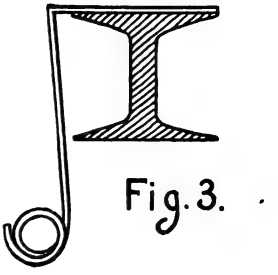




carried cast-iron fittings, the openings between the two tees being only 16 inches apart, as shown. In this instance we had to put in a 4-inch valve, the 4-inch flanges and the necessary nipples. All kinds of short nipples were tried and discarded. The piece containing the valve was made up on the floor several times, but without success, because both pipes were immovable and could not be sprung 1-16 of an inch. The valve measured 7 inches, the flanges 2 inches, and the three nipples 1½ inches. Finally we made up the two halves on the floor, and by means of a crowbar and several blocks of wood we managed to force them into place.

Fig. 2 represents a supporting column for carrying a steam main between two hothouses. The distance between the two houses was 15 feet. The column or stand is composed of pipe and fittings and an ordinary pipe-hanger. The main is 5-inch pipe.

In order to render the column secure, a



hole 2 feet deep was dug and a foundation built by first imbedding broken stone in cement, and laying on this brick in cement. After placing the flange, the whole was covered with cement, which was heaped up cone shaped around the 2-inch pipe as shown.

An improvised pipe-hanger is shown in Fig. 3. This is made by heating and bending a piece of ¾-inch wrought iron or steel about 3 feet long to fit over the I-beam and bending the lower end to receive the pipe. This is a simple and very good hanger for temporary use.

CEMENT FOR CLOSING LEAKS IN IRON PIPE.

The following formula is good for this purpose, but must be used as soon as mixed and rammed tightly into the joint or leak:

Five lb. coarsely powdered iron borings, 2 oz. powdered sal ammoniac, 1 oz. sulphur, and enough water to moisten. This cement hardens rapidly. However, the sulphur may be left out and it will set even more firmly, but require a longer time.

KEYS FOR SHAFTS.

Some Common Errors Which Should Be Avoided

Keys for securing pulleys, hubs, gears, flanges and kindred work on shafting are of several kinds: There are the flat keys, the round keys, the oval keys, the oblong keys and even threaded keys. The flat keys are in use for crank shafts of engines, large-sized gears, while the square key is found in use in machine work requiring extra accurate fitting. The illustrations given will assist in distinguishing the different types of strut and feathered keys as found in every-day service in shops, mills and general manufacturing establishments where modern mechanisms are employed.

Figure 1 is the deep setting square key; Fig. 2 the flat key; Fig. 3 the diamond-shaped key and Fig. 4 the round key; Fig. 5 shows the setting of the square key as at A. It is calculated that the sides of the key will sink equally into either part of the union. These square keys can be made to take a very firm grip if tapered right, so as to drive home to the keyway. The oval or partly rounded form of key at B, Fig. 6, is suitable only in special cases. The extremely accurate adjustments of fine mechanical motions cannot be made with this key, unless the work of the parts is light. The key serves for common purposes in light service, however, and may be found in use quite frequently. The diamond-shaped key is not often used. This is shown at C, Fig. 7. The round key is good enough when the parts are of such nature that a true hole may be drilled. Otherwise the key will wobble in an untrue seat and soon loosen and fall out. This key is used sometimes with a threaded shaft, the hole being tapped accordingly.

Sliding Keys.

The sliding feather is commonly utilized for bearings which are required to move from one side to the other in specific work, such as is required in the case of a clutch. This form of key is also used for spindles for drilling machines in which the shafts or the bosses move. The feather is loose in one seat or the other. Often we find that the combination is made with one key only. In other cases the double key system is used, thereby distributing the service. The feathered key is shown at Fig. 9. This key is not only useful for this purpose, but is the kind employed freely in the set unions and other types of key connections. Figure 10 illustrates another combination sometimes seen in shops and mills. This involves the use of two keys, each made alike, with edges binding one upon the other, and fitted to the coupling, flange, gear or wheel by driving one key at a time each from its own side. The keys thereby bind in the center of the work, and usually quite a substantial grip is afforded on the parts.

The Tapered Key Seat.

It is essential that the keyway be accurate in proportions. Key systems often fail because of the fact that the key seat is untrue. Sometimes the seat is made smaller at one end than the other, with the intention of using a straight key. Through error, a beveled key is driven in, with the result that the parts bind incorrectly. The parts hold a little while and then work apart.

Sometimes the seats are made with a dove-tail idea in mind, as suggested in Fig. 11. This involves the use of a key similarly shaped, with the "head" extended up into the keyway of the opposite part. Then again some machinists employ a keyway of the type exhibited in Fig. 12 for the purpose of utilizing round keys. The round key is driven home and, of course, presents a proportion of the key above the seat line, and this proportion is what grips in the round keyway of the opposing work. These specially formed keys are useful only in the particular cases in which they are employed.

Some Mistreatment of Keys.

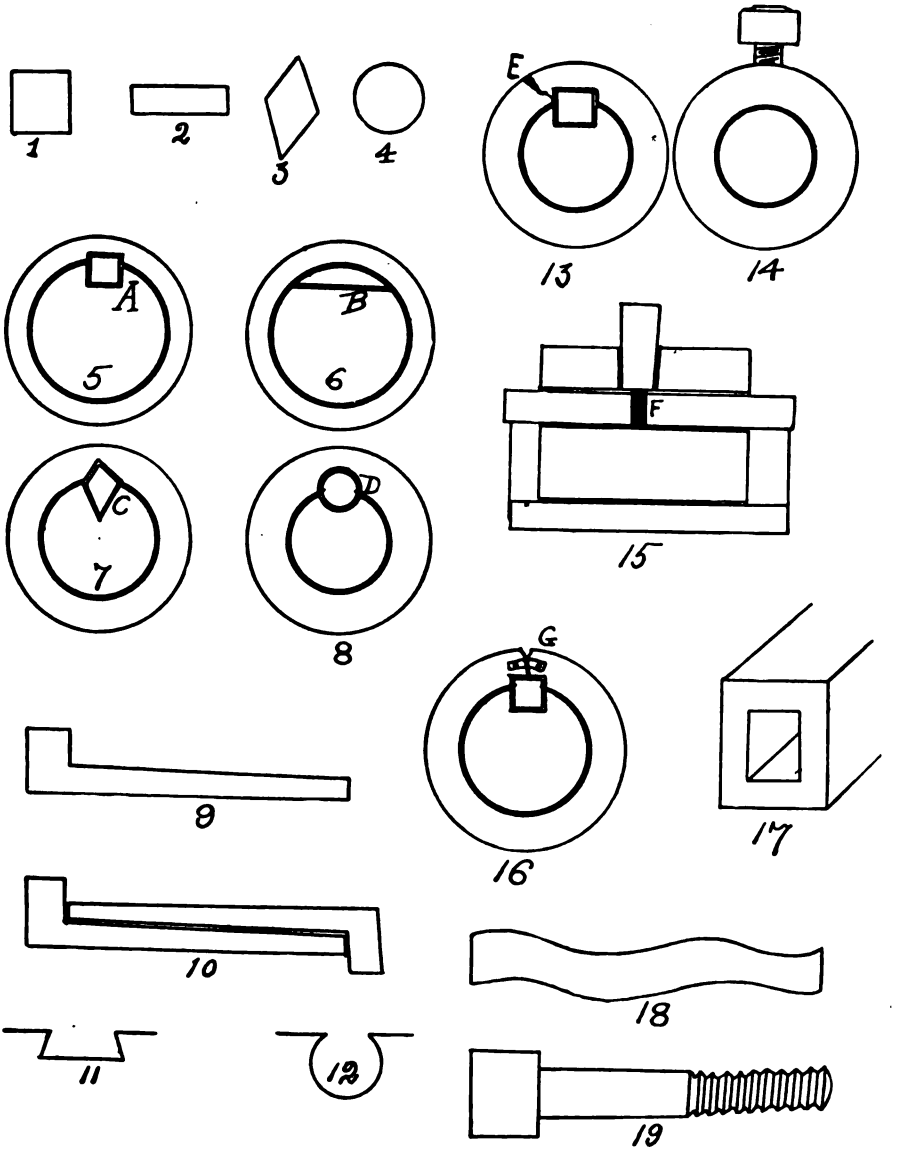
Figure 13 is a sketch of what one often notices in shops and power plants. It seems queer that this should be the case, but often a really good man gets careless, and unthinkingly delivers a blow to the key he is driving with such force that the collar or the hub is cracked as at E. The parts may cling together indefinitely, even though fractured. Then again the fact that the collar or hub is split, will cause the key to loosen and work its way out. Then a new collar must go on. Sometimes no collars are at hand, then the fractured collar must be strengthened with a band of metal shrunk around it. The set screw is utilized in place of the key now and then. In Fig. 14 we show the set screw substituting the key. In certain instances both the key and the set screw are used.

The set screw point is arranged to contact with the key, and this serves to hold the key in position. Fig. 15 is a sectional sketching of a combination given to illustrate

the carelessness of key insertion at times. This error was observed in a first-class shop. The parts were of such nature that the fastening key had to be driven through the sleeves to the shaft, much as pins are

supply produced heating, grating and wearing off of the metal. The arrangement had to be taken apart and restored with proper key-setting.

In another case a patched collar was used



used. The drawing shows the parts at the center bearing where the oil hole is completely closed by the point of the tapering key as at F. This combination ran well for a few weeks, then the stopping of the oil

on a shaft, keyed as in Fig. 16. A piece of strap metal G was riveted over the open parts. This developed a weakness in the collar, so that although tight, the key could not retain a positive bite on the metals, and

constantly worked free. The workman would drive the key home with a blow with the hammer now and then. This collar was substituted finally with a perfect one. A hollowed key is shown in Fig. 17. This was made for a large overshot water-wheel shaft of wood. The key itself is constructed from hardwood, with the hollow fitted with a shaft of metal. Thus the big wooden hub of the overshot wheel is secured to its shaft with a wooden key strengthened with a core of metal. The curved key seems to be a strange affair, still they may be found in use. Fig. 18 is a drawing of the snake-like pattern. This key cannot be driven. The seat for the key is modeled out in both the shaft and the hub of the work to receive the curls, and the curled key is dropped into place. It is curved likewise to suit the conditions of the roundness of shaft and hub. Figure 19 is a set screw made in key form. The key is made first, in rounded form, and then the threads are cut. This style of key is practically a threaded shaft.

"MACHINIST."

A NOVEL WAY OF BUSHING A FLY-WHEEL.

In a certain shop, where I worked some time ago, I was amused as well as interested at a job they were doing, writes one of our readers.

In one department of their works they had about a 22-horsepower steam engine, and for some reason or other the foreman of the department wanted a heavier flywheel put on. Finally a little heavier one was found, being about 4½ feet in diameter, 10-inch face and 3-inch bore. The engine crankshaft was 2½ inches in diameter, consequently it required a bushing ¼ inch thick.

The job of making the bushing was given to the machine shop and within a few hours it was ready. The bushing was put into the flywheel, and the wheel slipped on to the shaft and tightened. (The foreman of the department was standing watching the job without a word, as he had nothing to say over the machinists.) Finally the engine was started, and to the men's surprise the face of the wheel ran out considerably. They at once set aside to make new bushings, and in the meantime our foreman was getting very angry over what he called a bum job and besides the time lost in stopping the engine.

All looked for a warm time when they started to bush it the second time, and certainly were not mistaken. When the second bushing was finished and after considerable time spent in getting the old one off, it was finally placed on the engine again, ready to run. When the engine was started it ran out the same as the old one. They stood and watched it for a few minutes, until the boss got mad and told them to go back to their department, that he could do a better job with a rough sheet-iron bushing. The boys were rather offended at this and said he would never get it bushed to run true. "Well," said Mr.——, "I'll bet any one of you $50 that I will take a rough sheet-iron bushing and bush that wheel to make it run perfectly true." This seemed like a one-sided bet in favor of the boys, and they were overly-anxious to take it, and agreed to do so. The boss gave them until next day to get the money. The next day came, but no money was up by the boys, and the boss must have been in good humor, for he went out to the machine shop and told the several machinists who had helped on the job to come in and he would teach them something free of charge.

He straightway set about and took a piece of ¼-inch boiler plate and bent it around a shaft until it fitted the flywheel (this bushing was not turned on the outside, but left rough), he then put the flywheel on to the shaft and started up. It ran out ten times as badly as the boys' job and, consequently, they all laughed. But, alas! the job was not done yet, and he evidently had started it to see what they would say; at the same time he knew it would be worse. He never said a word, but picked up a piece of chalk, and while yet running marked the wheel where it was out. When they stopped the engine he took a fuller and, by aid of a helper striking, he caulked the side opposite to where it ran out, and by starting and stopping a few times to chalk and true the wheel, he had done the job within three-quarters of an hour after it was placed on the engine, and a more perfectly running flywheel on an engine you never saw.

This job proved very interesting to me and I thought it was well done, and I trust it will interest all who read it. N. M.

The article "Trimming Arc Lamps by Automobile," appearing in our November issue, was by mistake credited to the Western Electrician. This method was first described in the columns of the Bulletin of the New York Edison Company.

LAYING A COPPER ROOF.

A copper roof laid with 140-lb. copper costs, including material and labor, about $35 per square. Such a roof will last a long time. The Metal Worker gives excellent directions for the work. If a rib roof is desired use dressed wood strips 2 in. square, with the strips 20 in. apart. The cuts show manner of turning the edges. The copper is rolled out and 2½ in. turned up square on each side, then ½ in. is turned in square toward the center of the sheet.

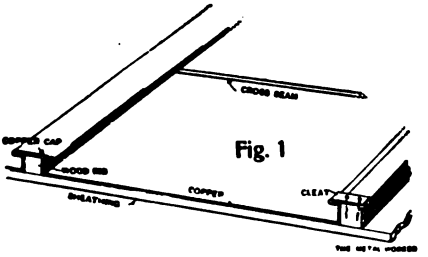


Fig. 1

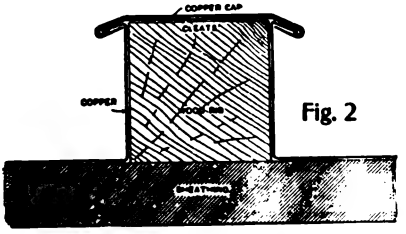


Fig. 2

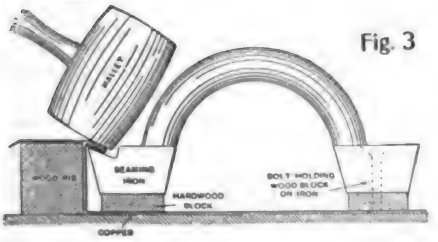


Fig. 3

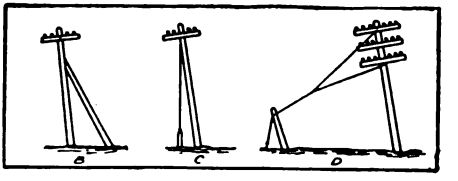
This edge is then cleated at intervals of about 6 or 8 in. to the wood strip. A cap strip of copper, cut about 4 in. wide, is then locked onto the edges of the copper, covering the wood rib and hiding the cleats. No nails should be driven through the copper. The sketch, Fig. 1, shows the method better than any written explanation.

Whether put on with ribs, as above described, or like a standing seam roof, the copper should be put together in rolls the same as tin; only it is preferable to use long sheets instead of 14 or 28-in. sheets, thereby lessening the amount of copper, solder and labor required. If the ribs are spaced 20 in. apart it will be found that there will be required to cover the space from the edge of one rib to the corresponding edge of the other rib, 4 in. for the cap, plus ½ in. on the top of the course, plus 2 in. up against the rib, plus 18 in. to the next rib, plus 2 in. up, plus ½ in. out, or a total of 27 in. is required to cover 20 in., net, of space.

A nice way of closing up the edges after the caps are put on, and also of turning the same down slightly, is to take an ordinary seaming iron, such as is used on tin roofs, drill two holes through it on each side, bolt on hardwood strips on each side, thick enough to raise the iron to the desired height, and then have it channeled out on one edge to the desired bevel. Then, by running it along the seam, the edges can be closed tight with a mallet and turned down to the angle desired at the same time. This operation is shown in the sketch, Fig. 3.

PUSH-GUYING TELEPHONE POLES.

Sometimes in constructing telephone lines a pole is so located that it cannot be guyed directly to the ground, says the American Telephone Journal, and the guy wire must



Push-Guying Poles

be taken across a road. If there is a tree convenient it may be attached to that, but if not it must be push-guyed, as shown in the sketch.

The push guy, B, is a pole set so as to lean towards and against the pole carrying the wires and is firmly fastened to it near its top. The push guy thus serves to push the pole away from the direction of the strain of the wires. A method of guying a pole from a point near its butt by means of an anchor is shown at C, and D shows a "Y" guy for heavy leads.

TO LETTER ON CANVAS.

In lettering on canvas, if the canvas is first dampened with water, the paint will not spread, nor will it dry too soon.

BRAZING CAST IRON.

Brazing cast iron is no longer one of the things which cannot be done. On the contrary, in the hands of an experienced workman the results are extremely satisfactory. In places remote from sources of quick supply the process is almost invaluable. A correspondent in the Blacksmith and Wheelwright tells his method.

We take a hack saw and put into the broken parts like Fig. 1, then we put in

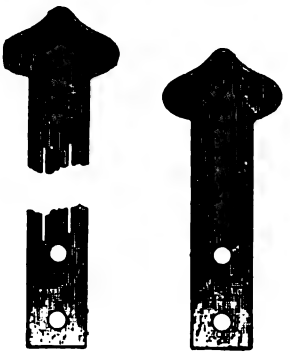


Fig. 1 Fig. 2

Brazing Cast Iron

a piece of steel like Fig. 2 to hold the parts in place while brazing, then place in the forge and apply the brazing compound. Powdered borax will answer the purpose, but leaves more scale on than the brazing compounds. After the iron is heated to a bright red and the flux has flowed over the joints, apply the brazing spelter with an iron (one-fourth inch flattened on one end will do) and heat until the brass flows freely over all parts of the joint; then remove from fire and let cool slowly. If plunged in cold water while hot the sudden contraction may spoil the brazing. We use a three-burner gasoline brazing forge, and can do a much better job on it than can be done in an ordinary forge. There is not as much danger of burning the iron and one can always see what he is doing, besides it makes a much cleaner fire than coal.

We have successfully brazed brass castings and some very difficult iron castings. We do a large amount of boiler work, such as retipping flues, etc., and braze all the flues, making a much neater and stronger job than can be done in welding, and consider this forge as one of the best investments a smith can make, as many times it will save a thresherman or farmer a delay in the busy season. In successfully brazing cast iron all grease should be removed and paint (if there is any) should be removed from the near joint.

AUTOMATIC ELECTRIC CIRCULAR SAW MILL.

A man who owns a large plantation on the island of Sumatra has invented an automatic electric circular saw mill which is a great improvement in this line.

Two kinds of mills have been fitted up—log saws and resaws and in both the saw is fed along the log instead of feeding the log to the saw. In the log saw mill an iron track is made fast to the middle line of the log by means of clamps extending down to grip the center of the log. A carriage bearing a small electric motor runs on this track and on the under carriage is a cross carriage which can be rotated about a vertical axis by means of a handwheel and a screw. This cross carriage bears the principal motor that carries the saw. The small motor feeds the carriage along the track and the large motor runs the saw through the wood during the cut. By means of the cross carriage or slide the saw can be fed across the log the width of the board to be cut plus the kerf and by turning the carriage on the vertical axis the saw can be turned 90 degs. about the axis and makes a cut in the reverse direction at the same speed as in the first cut. This avoids shock at the reversing points and also saves time.

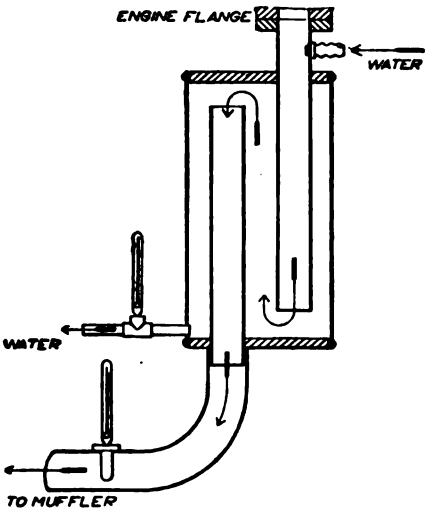
"The resaw," says a correspondent of the Wood-Worker who saw the invention in operation, "is lighter and more simple. The balks or planks are laid on round wooden supports and piled up to the maximum height of one foot. The planks are clamped together. The track and carriage are then set on the pile and fastened thereto by clamp bolts at the ends."

Power can be brought any distance to the machine by insulated wires, in this instance it was brought a distance of 3250 yds. and for small logs 60 h. p. was required.

Twenty-eight-inch logs can be cut by a saw 6 ft. in diameter. For logs larger than this a cut is made to the depth the saw can handle and the saw is then turned 180 degs. about its axis and a cut made from the opposite direction. This is claimed to be the single weak point of the apparatus, for a little lost motion in the machine will cause the kerfs to come blind.

MEASURING WASTE HEAT FROM GAS ENGINES.

A method of measuring waste heat carried off in the exhaust from gas engines consists of a calorimeter mounted in the course of the exhaust gases, close to the engine, in which the gases are cooled by jets



Method of Measuring Waste Heat from Gas Engines

of water in such a way that the temperature of the entering and outflowing water can be readily ascertained. A very simple form of this device is shown in the sketch by means of which the gases from a 10-hp. engine were cooled to 107 deg. F.

The calorific value of the gas supplied to the engine was determined and its quantity measured, while the indicated horsepower, the rise in temperature of the circulating water, and the heat carried off in the exhaust were observed. The engine had a cylinder 7 in. in diameter, and a stroke of 15 in., and ran at 250 revolutions per minute.

The results showed that the jacket water carried off 32 per cent of the heat energy supplied to the engine, the exhaust gases gave up 34.5 per cent to the calorimeter and carried away 1.5 per cent to the chimney, and the indicated work amounted to 26 per cent of the total energy, leaving 6 per cent unaccounted for. The temperature of the gases was reduced to 107 deg. F. in the calorimeter, the jacket water at exit was at a temperature of 105 deg., and the indicated horsepower was 14.2. The missing 6 per cent was mainly attributable to radiation and conduction from the engine.

RECIPES FOR POLISHING BRASS.

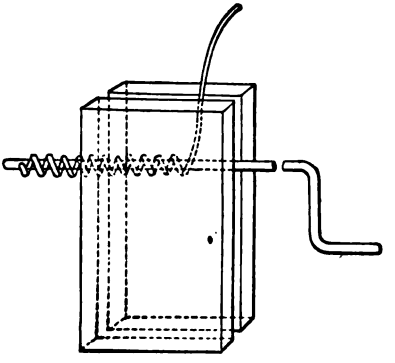
Three parts oxalic acid dissolved in 40 parts hot water; add 100 parts powdered pumice stone, 2 parts oil of turpentine, 12 parts soft soap and 12 parts fat oil.

Or: Four oz. rottenstone, 1 oz. oxalic acid in fine powder, 1½ oz. sweet oil, enough turpentine to make a paste.

SIMPLE METHOD OF WINDING COIL SPRINGS.

Coil springs of any pitch and of wire up to ⅛ inch in diameter may be wound by the simple device shown in the illustration, says a correspondent of the American Machinist. Make a winding mandrel of a piece of iron rod about 1-32 inch smaller than the inside diameter of the spring is to be. Bend a crank on one end and drill a hole for a wire inlet. Near the other end clamp two softwood blocks in the vise with the mandrel in position, small hole up. Insert the wire and turn the crank.

The pitch can be regulated by holding the wire at the proper angle. When the



Winding a Coil Spring.

spring reaches the outside of the blocks it has cut grooves in the wood corresponding to the pitch of the spring. On short springs the pitch can be duplicated, or a spring can be made of any length by opening the vise slightly, pulling back the mandrel and clamping the spring to the mandrel with a lathe dog. Springs made in this way acquire a good polish.

A TABLE OF PRINCIPAL ALLOYS.

A combination of zinc and copper makes bell metal.

A combination of copper and tin makes bronze metal.

A combination of antimony, tin, copper and bismuth makes britannia metal.

A combination of copper and tin makes cannon metal.

A combination of copper and zinc makes Dutch gold.

A combination of copper, nickel and zinc, with sometimes a little iron and tin, makes German silver.

A combination of gold and copper makes standard gold.

A combination of gold, copper and silver, makes old standard gold.

A combination of tin and copper makes gun metal.

A combination of copper and zinc makes mosaic gold.

A combination of tin and lead makes pewter.

A combination of lead and a little arsenic, makes shot metal.

A combination of silver and copper makes standard silver.

A combination of tin and lead makes solder.

A combination of lead and antimony makes type metal.

A combination of copper and arsenic makes white copper.

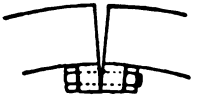
WHY FLYWHEELS BURST.

A simple explanation of the operation of a flywheel in bursting appears editorially in Page's Weekly, London, as follows: The tension upon the rim of a revolving wheel augments as the square of the velocity—that is to say, supposing for the moment that we had a wheel with a rim a foot square, revolving at the rate of 100 feet per second—the material being cast-iron—the total resolved forces tending to tear the rim asunder would be, say 144,000 pounds. Now, imagine this velocity to be increased by the failure of the governor to act, or otherwise, to 150 feet per second, or one and a half times as fast as before—a perfectly possible case—and we have 324,000 pounds to deal with. Double the original speed, and we have 576,000 pounds.

Just one more fact about our hypothetical wheel before we turn these figures to account. Supposing the wheel to break up under the stress due to the last-named speed—200 feet per second—there is energy resident in that rim sufficient to project any part of it which might happen to be discharged vertically 600 feet into the air. This will give some idea of the potential force lying dormant in a flywheel. A well-known American writer who has made this subject his specialty, thus records his opinion: "A flywheel is just as dangerous as a boiler, and should be subject to inspection in like manner. The time to investigate a flywheel is during its lifetime, and the one to investigate it is a trained inspector, who can pronounce intelligently on its safety, or condemn it if dangerous."

The bursting speed of a solid cast-iron rim—i. e., without joints and free from contraction stresses, is about 425 feet per second. If the rim be built up of several parts, the sectional area at the joints may be reduced by recessing for dowels or cramps, to an extent which at once lessens its ultimate strength by one-half. It is too much to expect the joints to be of equal strength with the solid metal, but in proportioning the relative sectional areas of cast-iron rim and steel bolts or cramps it is not difficult to arrange them inversely as their respective tensile strengths, and so obtain the maximum efficiency.

Wheels with deep rims should never be joined by internal flanges and bolts; centrifugal force tends to open the joint and bring a leverage to bear upon the bolts which may be as much as four to one, compared with the same bolts in direct tension.



In the case of thin-rimmed wheels, as rope or belt pulleys, for example, where internal flanges are almost a necessity, this leverage is not nearly so pronounced, but still it exists, and should be taken into account.

Each rim-section of a wheel, built up of segments with the joints midway between the arms, is in the condition of a beam supported at the ends, and uniformly stressed. The maximum bending moment occurs, of course, at the centre of the beam, and consequently the joint is in the least favorable position possible. It should be either at the arm or as near to it as practicable.

Inasmuch as the term Manual Training School is said to be no longer definite, it is suggested that it be called Industrial Art School.

PISTON RINGS.

A correspondent to the National Engineer writes as follows regarding the development of piston rings, and the advantage of steel packing rings over cast-iron rings:

Many years ago railroad master mechanics employed spring steel packing rings in the cylinders of locomotives, and at first they thought they had a good thing. The piston consisted of a spider, a follower, a spring steel bull-ring set out by three elliptic springs and two spring steel packing rings. The packing wore down very rapidly and the engineers were continually complaining of "blowing" pistons, which necessitated constant setting out of the packing. After some time the use of steel rings was abandoned, and babbitted brass packing rings substituted for them, the same spider, etc., being retained. This packing gave better satisfaction than the steel rings, but still it did not completely fill the bill, since the engineers still complained of "blowing" pistons. Later on a man named Dunbar invented a steam packing. This packing was made entirely of cast iron, and consisted of a large number of segments of a circle, and it was set out by the action of the steam in the cylinder. This packing was durable and gave most excellent satisfaction, but there was one objection to it, and only one, but a serious one—it was entirely too expensive to make and fit in the different sized cylinders. After a time a man named Stevenson invented a substitute for Dunbar packing. Stevenson packing consisted of a cast-iron solid bull-ring—that is, the ring was not cut across—and two cast-iron packing rings. The bull-ring was centered on the piston and then pinched in place by the follower. The packing rings were cut across diagonally, and they were set out by their own tension. This packing was cheap to make and gave the best of satisfaction. After a time master mechanics came to the conclusion that they could very well dispense with Stevenson's bull-ring and follower while retaining his cast-iron packing rings. This led to the adoption of the cored solid piston with two grooves sunk in it to admit the packing rings, which, as in the other case, were set out by their own tension. This arrangement makes the cheapest and best piston ever put into a steam engine cylinder. Spring-steel contains but ¾ per cent of carbon, while the iron in a steam engine cylinder contains 3½ per cent of carbon. Thus it will be seen that the packing rings when made of spring-steel—the softer metal—will wear down very rapidly.

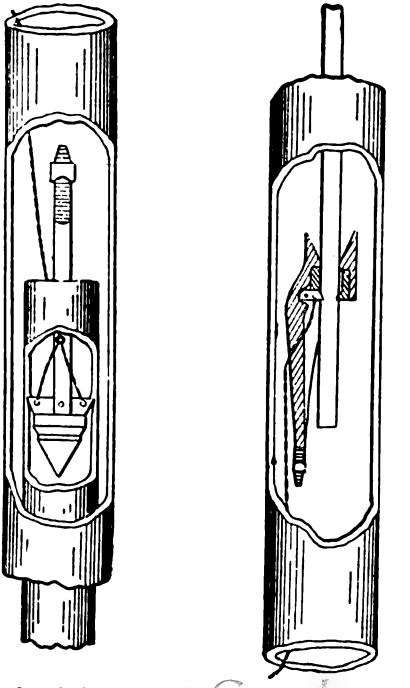
TO PREVENT WATER FROM FREEZING.

A fire insurance company in one of its reports calls attention to the use of chloride of calcium in small quantity at little cost in buckets and pails where the water may freeze in very cold weather. This material can be had on a large scale. It tends not only to prevent freezing but in a certain measure acts like salt in preserving the water from deterioration.

FISHING TOOLS FOR USE IN DEEP WELLS.

The job of fishing broken rods from deep wells has occasioned many a man no end of trouble and loss of time. A correspondent of Power has devised a tool for fishing for rods and another for pipes which he used successfully for this purpose. He says:

"I had a 4-in. pipe 21 ft. long drop to the bottom of my 300-ft. well, wedging itself



Tools for Fishing Broken Rods and Pipe Out of Wells

in a tapered hole. It had a coupling on the lower end and it was no easy matter to pull it. Having broken several tools, I designed this one which did the trick, standing a pressure of about 25 tons on the jacks before it loosened. You will see I have applied the same method for lifting rods. I use different sized bushings for various sized rods. The pawl works against a bearing in the carrier and has an oblong hole so as to relieve the shearing strain on the rivet. The ring on one tool and the bushing on the other are the fulcrum for the pawls to rest on.

POWER REQUIRED FOR AIR LIFT.

The following data may be of interest to readers who have to deal with the air lift, says A. H. Goff of Roswell, N. M., in the Engineer. For the proper working of an air lift a certain amount of submergence is necessary. For the most economical and efficient results a submergence of 60 per cent should be used. That is, 60 per cent

RATIO OF WATER TO AIR REQUIRED.

For Lifts Not Exceeding					
25 feet	2	vols. of air	to	1	of water
50 feet	3	vols. of air	to	1	of water
75 feet	4½	vols. of air	to	1	of water
100 feet	6	vols. of air	to	1	of water
125 feet	7½	vols. of air	to	1	of water
150 feet	9	vols. of air	to	1	of water
175 feet	10	vols. of air	to	1	of water
200 feet	12	vols. of air	to	1	of water

VOLUME OF FREE AIR, AIR PRESSURE, SUBMERGENCE AND HORSEPOWER.

Lift Ft.	Submergence Ft	Air pressure.	Free air per min Cu. ft. per gal.	I. HP. per gal.
25	38	17	0 3	0.0184
50	75	33	0 4	0 0426
75	113	49	0 6	0.0828
100	150	65	0 8	0.1320
125	188	82	1 0	0.1910
150	225	98	1.2	0.2544
175	263	115	1 4	0.3150
200	300	130	1 6	0 3808

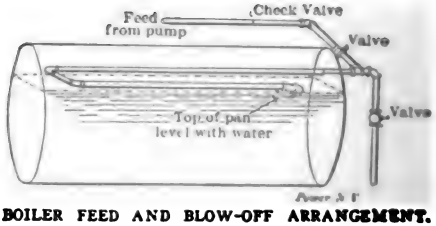
of the total length of the water discharge pipe should be below the water level in the well when pumped to its full capacity. For instance, let us assume that in a well 200 feet deep when pumping the water sinks to 40 feet below the surface of the ground, and it is desired to lift the water 20 feet above the surface of the ground. This gives length of pipe 60 feet to the water level in the well, and, as this does not include the submerged part of the pipe it is only 40 per cent of the total length of water discharge pipe, the total length will, therefore, be 60 feet plus 1½ times 60 or 90 feet submergence, making a total length of 150 feet of water discharge pipe.

It is not safe, unless under very favorable conditions, to figure on raising the water by the air lift system more than 200 feet above the lowest water level in the well. Nor is it always safe to extend the horizontal discharge more than 500 feet, as the air lift is not adapted to pumping horizontally to any great distance, unless reinforced by a pneumatic direct pressure pump, or an ordinary piston pump. Either of which, however, could be operated by compressed air from the same pipe that supplies the well.

Suppose, for instance, that it is desired to lift 120 gallons of water 100 feet high per minute. It will be seen by the above table that this will require 150 feet submergence, thus making 250 feet of water discharge pipe, 65 pounds air pressure, 96 cubic feet of free air per minute and a compressor developing 15.84 horsepower.

GOOD ARRANGEMENT OF BOILER FEED AND BLOW-OFF.

A very satisfactory arrangement of an internal feed pipe and a blow-off connection is shown in the accompanying sketch. The pipe, which is larger than is generally used, makes a circuit of the boiler, entering at about the water line at the front head and



BOILER FEED AND BLOW-OFF ARRANGEMENT.

terminating in a pan, the top of which is level with the water line. The feed water passes slowly through the pipe and is heated enough to precipitate much of the scale-forming matter. When the blow-off is opened, says a correspondent of Power, it is surprising to see the amount of mud that will be blown out.

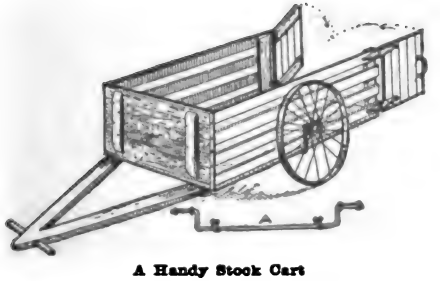
TO MAKE BLUEPRINTS BROWN.

Young as well as older photographers may be interested in learning how to make blueprints turn brown. The method is simple. Dissolve a piece of caustic soda the size of a kernel of corn in about five ounces of water. Immerse the blueprint in this till the print changes to an orange yellow. Then wash the print thoroughly in a bath composed of a heaping teaspoonful of tannic acid dissolved in eight ounces of water. You may leave the print in this mixture till it has become the desired tint of brown, after which thoroughly wash the print and allow it to dry slowly.

HOW TO BUILD A STOCK CART.

Any farmer can make his own stock cart after the manner of the one shown in the illustration and will find it a great convenience whether he has much stock or not.

The cart has a drop axle (A) worked over at a blacksmith forge from two discarded buggy axles. It should be left standard track width and have pieces 1 ft. long inserted near the stubs at each end to form the drop. This is to bring the bed nearer the ground. The bed can be made of any lumber about the farm and should be just the width to fit into the axle



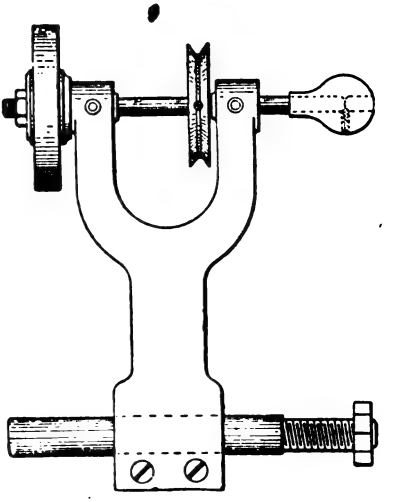
A Handy Stock Cart

and 5 ft. in length, and bolted to the axle near the middle of the bed. Bolt a cart handle on the front and fit the rear with two doors and a strong latch. Mount the whole on wheels and, according to a correspondent of the Ohio Farmer, you will have a "stock chariot" which cannot be surpassed.

This cart can be readily backed up, when mounted upon wheels, to any pen, the rear-end dropped to the ground, doors closed behind, the cart attached to the rear of any other vehicle, and the animals transported as many miles as desired, with ease. By making the front end-gate and cart handle detachable, this "rigging" can be wheeled up to the rear of a wagon and used for a chute in loading hogs or sheep.

DEVICE FOR TRUING COLLECTOR RINGS.

The machine shown in the sketch was fitted up by a correspondent of the Engineer, for truing up badly worn cast-iron rings on



Machine for Truing Collector Rings

a G. E. compensated revolving field alternator. He describes its operation as follows:

The emery wheel is passed across the rings while the machine is running slowly. The wheel is run at a speed of 3000 revolutions per minute by a small motor. It puts the rings in fine shape and saves taking the head to a machine shop. Then, too, while turning the rings they are liable to get out of place. Strips bolted in where the brush-holder is taken off and the rig clamped to the bolt by two screws, the bottom of the casting being split to insure a tight grip, will serve the purpose.

Very few people can draw two different pictures simultaneously, but an Englishman, Sir Edward Landseer, recently proved that he could. With the right hand he drew the profile of a stag's head with antlers, complete, while with the left he drew a horse's head. One drawing was as good as the other and the acts of draftsmanship did not alternate.

Tables Showing the Percentage of Cotton, by Weight, on Magnet Wires of Various Sizes

These Valuable Tables, Which We Have Not Seen Anywhere in Print, are Contributed by W. S. Holmes

RECTANGULAR WIRES.

Single Wound.

Size.	Per Ct.	Size.	Per Ct.	Size.	Per ct.
.070 x .050	.019	.225 x .028	.0175	.350 x .090	.008
.074 x .056	.0175	.232 x .020	.022	.355 x .075	.009
.090 x .054	.017	.240 x .075	.011	.355 x .120	.006
.092 x .050	.0175	.250 x .075	.011	.360 x .100	.007
.095 x .075	.013	.260 x .064	.0105	.360 x .105	.0065
.100 x .050	.015	.270 x .070	.010	.360 x .110	.006
.100 x .065	.014	.280 x .062	.0105	.370 x .064	.0095
.100 x .074	.013	.280 x .095	.007	.375 x. 075	.0085
.100 x .080	.0115	.300 x .080	.000	.375 x. 090	.008
.105 x .090	.011	.300 x .110	.0065	.380 x .065	.0095
.122 x .095	.010	.310 x .060	.012	.390 x .110	.006
.125 x .070	.0125	.320 x .075	.0095	.420 x .115	.006
.125 x .115	.0095	.320 x .082	.009	.435 x .110	.006
.135 x .095	.0095	.320 x .125	.0055	.4375x .065	.009
.140 x .505	.015	.330 x .035	.019	.460 x .080	.0085
.200 x .030	.017	.335 x .115	.006	.490 x .105	.006
.200 x .042	.012	.340 x .045	.014	.5625x .084	.008
.200 x .070	.012	.340 x .088	.008	.550 x .110	.0055
.215 x .055	.012	.350 x .080	.009	.675 x .052	.011
.215 x .090	.008				

Round Wires.

No.	Size.	Per ct. S. W.	Per ct. D. W.
2	.2576		.010
3	.2294		.011
4	.2043	.007	.012
5	.1819	.008	.013
6	.1620	.009	.014
7	.1443	.010	.016
8	.1285	.011	.018
9	.1144	.013	.020
10	.1019	.012	.022
11	.0907	.013	.024
12	.0808	.015	.027
13	.0719	.018	.030
14	.0640	.021	.033
15	.0571	.022	.037
16	.0508	.026	.041
17	.0453	.030	.046
18	.0403	.033	.055
19	.0359	.036	.059
20	.0320	.038	.062
21	.0285	.040	.070
22	.0253	.041	.080
23	.0226	.045	.094
24	.0201	.051	.097
25	.0179	.048	.100
26	.0159	.052	.115
27	.0142	.060	.135
28	.0126	.072	.155
29	.0113	.087	.190
30	.0100	.010	.210
31	.0089	.011	.220
32	.0080	.125	.250
33	.0071	.150	.300
34	.0063	.170	.340

Square Wires.

Size.	Per ct. S. W.	Per ct. D. W.
.068 x .068		.026
.064 x .064	.016	.026
.075 x .075	.015	
.072 x .072	.013	
.077 x .077		.023
.081 x .081		.023
.085 x .085	.012	
.0907 x .0907		.021
.098 x .098	.011	
.108 x .108		.017
.1144 x .1144		.019
.120 x .120	.008	
.121 x .121	.008	.017
.128 x .128		.016
.135 x .135		.018
.143 x .143		.013
.162 x .162		.014
.187 x .187		.013
.195 x .195		.013
.325 x .325		.010

RECTANGULAR WIRES.

Double Wound.

Size.	Per ct.
.034 x .071	.026
.092 x .071	.023
.100 x .050	.032
.100 x .063	.028
.100 x .085	.021
.104 x .091	.020
.110 x .096	.019
.120 x .050	.027
.122 x .105	.018
.125 x .040	.034
.125 x .075	.023
.125 x .095	.019
.130 x .070	.025
.130 x .100	.020
.131 x .090	.021
.141 x .109	.017
.141 x .095	.018
.145 x .119	.015
.145 x .128	.015
.150 x .035	.034
.150 x .040	.030
.150 x .100	.018
.150 x .110	.018
.155 x .080	.020
.158 x .142	.015
.160 x .100	.018
.160 x .110	.016
.162 x .127	.015
.170 x .060	.024
.170 x .075	.020
.170 x .090	.020
.170 x .100	.016
.175 x .075	.020
.175 x .109	.015
.176 x .130	.014
.178 x .157	.013
.180 x .040	.029
.180 x .045	.028
.180 x .080	.019
.183 x .077	.020
.185 x .075	.020
.185 x .090	.019
.185 x .125	.014
.187 x .050	.027
.190 x .060	.027
.190 x .145	.013
.192 x .087	.019
.200 x .020	.053
.200 x .035	.032
.200 x .086	.018
.200 x .095	.019
.200 x .105	.018
.200 x .120	.015
.210 x .070	.022
.210 x .125	.014
.210 x .155	.011
.215 x .085	.019
.215 x .105	.015
.215 x .140	.013
.219 x .167	.010
.220 x .045	.028
.220 x .070	.022
.220 x .095	.018
.220 x .115	.015
.220 x .120	.014
.220 x .125	.013
.220 x .193	.0095
.225 x .022	.051
.225 x .025	.046
.225 x .055	.027
.230 x .100	.010
.232 x .132	.013
.232 x .162	.011
.232 x .180	.011
.235 x .075	.019
.235 x .085	.018
.240 x .095	.017
.250 x .050	.025
.250 x .062	.021
.250 x .069	.035
.250 x .080	.021
.250 x .093	.017
.250 x .095	.017
.250 x .100	.015
.250 x .125	.014
.260 x .040	.030
.260 x .060	.021
.260 x .100	.017
.265 x .185	.011
.270 x .090	.016
.275 x .110	.018
.280 x .034	.032
.280 x .080	.020
.280 x .115	.014
.280 x .120	.014
.280 x .180	.012
.282 x .063	.020
.290 x .052	.026
.290 x .084	.019
.295 x .115	.014
.300 x .050	.028
.300 x .055	.026
.300 x .080	.019
.300 x .100	.014
.300 x .107	.014
.300 x .110	.014
.300 x .115	.014
.300 x .120	.014
.300 x .140	.011
.310 x .060	.023
.310 x .065	.022
.310 x .120	.013
.320 x .105	.015
.325 x .160	.011
.340 x .040	.025
.340 x .050	.023
.340 x .060	.022
.340 x .080	.019
.340 x .090	.016
.340 x .100	.014
.340 x .125	.013
.340 x .175	.009
.345 x .100	.014
.350 x .100	.014
.350 x .130	.011
.360 x .085	.018
.365 x .132	.011
.370 x .072	.019
.370 x .100	.014
.370 x .140	.010
.370 x .250	.008
.375 x .070	.019
.375 x .090	.015
.380 x .034	.035
.400 x .029	.038
.400 x .070	.019
.400 x .085	.018
.400 x .090	.015
.400 x .110	.014
.400 x .115	.013
.400 x .140	.010
.415 x .055	.026
.420 x .095	.013
.420 x .125	.011
.450 x .120	.012
.455 x .024	.060
.460 x .070	.019
.475 x .100	.013
.500 x .090	.015
.500 x .095	.013
.500 x .100	.013
.500 x .110	.012
.500 x .120	.012
.520 x .060	.021
.535 x .085	.015
.540 x .125	.011
.550 x .100	.013
.563 x .100	.013
.570 x .125	.011
.575 x .105	.012
.650 x .105	.012

TO BLACKEN BRASS.

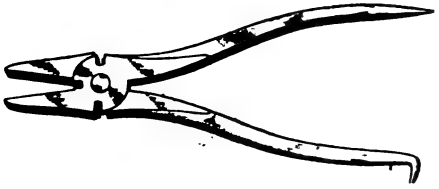
A—Nitrate of silver, 120 grains; water, 5 ounces; B—Nitrate of copper, 120 grains; water, 5 ounces. Mix in equal quantities sufficient to cover the piece of metal which has to be blackened. Cleanse the brass of all grease in hot soda water and dip in the above solution, then heat it in an oven until black enough.

WIRE SOLDER.

Tin, one part; lead, one part; bismuth, one-half part. Melt together and pour through a perforated dish onto a stone or metal slab, moving the dish along as the solder runs through and cools. Some prefer to use a funnel with a fine orifice instead of the perforated dish in pouring the solder on slab.

TOOL FOR USE IN LACING BELTING

A very handy tool for use in lacing belting consists of a pair of ordinary pliers having one end made into a hook for use in taking out old belts, which is usually very difficult, and the other sharpened to a point like an awl, so that, should the holes in the new belting be a trifle too small they can be punched to suit. The pliers are used to grab the lace when it is started. In stretching bolting silk or any cloth, the pliers, having the nose ground thin, are very handy for holding the cloth while tacking or nailing.



Handy for Lacing Belts

The pliers may be used also for cutting wires, or cutting wire nails shorter when the right size is not on hand.—Contributed by J. F. Gunsolley, Independence, Mo.

A GOOD METHOD OF REPAIRING RUBBER ARTICLES

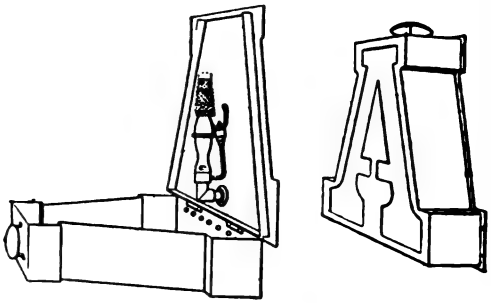
Cut up into tiny bits a 1½-in. square piece of red rubber, put it into a bottle, pour a teaspoonful of chloroform on it, and cork it up tightly. Let stand for ten minutes, when it will be melted sufficiently for use.

Cut a piece of rubber dam considerably larger than the place to be mended, and if the hole is large take a few stitches in it. Wet the impaired article with chloroform and as quickly as possible apply a layer of the melted rubber over as large a surface as the piece of dam you have cut. Use a small stick for applying the melted rubber. Wet the dam with chloroform and stick it on. If the hole is very bad, a second piece of the dam and more of the melted rubber may be used. Five cents' worth each of the red rubber and the dam will suffice and the remainder of the melted rubber may be used again by adding chloroform.

The little kink that saves you trouble and labor every day or week would help the other mechanic, too, if he but knew it. Send us a rough sketch and brief description. This department is for men of every craft, and that includes you.

GASLIGHT FLASH SIGNS FOR SHOW WINDOWS

Flash signs for show windows using gas instead of electricity may be fitted up so satisfactorily that the effect produced is quite the equal of that produced by the electric flash sign, says a correspondent of the Acetylene Journal.



Gas Flash Light for Signs

A diaphragm having a varying pressure upon it regulates the flow of the gas. When enough gas for a flash has entered the pipe, the diaphragm is forced up and automatically works a plug in a supply pipe. By this means a small quantity of the gas is let into the lamps at regular intervals, makes for an instant a flash of bright light and then goes out, except the little point of light which keeps the burner going.

The illustration shows how the gaslight flash signs are managed abroad. The lower part of the letter is hinged at the bottom and each letter is a sheet iron lantern with a reflecting back wall and fitted inside with an incandescent lamp. The front of the lantern is of opal glass to show up the characters. To prevent overheating and undue action of the wind, the air currents are carefully calculated. Clockwork regulates the flow which acts upon the gas supply to each letter, and each letter has a separate outlet, all being controlled by the rotation of the same cylinder.

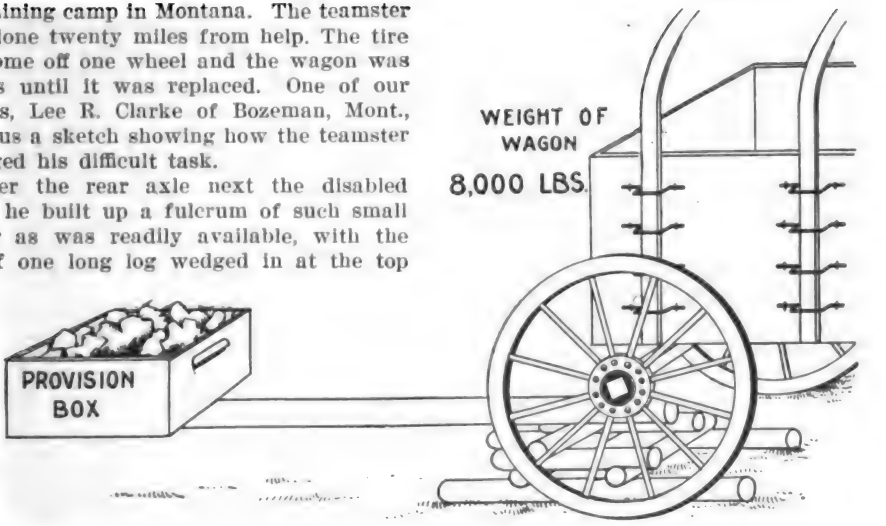
The consumption of coal gas per letter is about half the full consumption of the incandescent burner used, and for ten letters, ten incandescent burners are enough, with a consumption of about 4.5 cubic feet each —that is, about 2.25 cubic feet of coal gas each in actual use, while with electricity 122 lamps of five candles each would be required. To compute a corresponding use of acetylene is easy. The cost with gas is about one-eighth that of electricity for the

SHOP NOTES

REPAIRING A WAGON LOADED WITH 8,000 LBS. OF MACHINERY.

A wagon loaded with heavy machinery, wagon and load together weighing 8,000 lbs., broke down while on the way to the Crooke City mining camp in Montana. The teamster was alone twenty miles from help. The tire had come off one wheel and the wagon was useless until it was replaced. One of our readers, Lee R. Clarke of Bozeman, Mont., sends us a sketch showing how the teamster managed his difficult task.

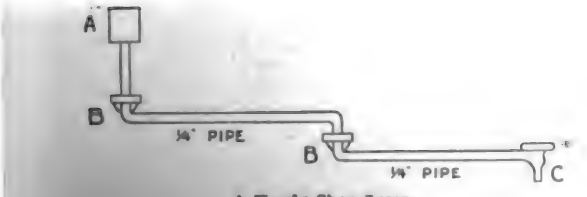
Under the rear axle next the disabled wheel he built up a fulcrum of such small timber as was readily available, with the end of one long log wedged in at the top next the axle to serve as a lever. At the other end of this log was fastened a provision box, and into this were piled rocks until the weight was sufficiently great to bear down the end of the pole on which it rested, and so lift the wagon resting on the other end, when the wheel was easily repaired.



Repairing a Loaded Wagon.

A HANDY SHOP LAMP.

A very handy shop lamp may be made in the manner shown in the sketch. A is the tank, B and B are union swivels, and C is the burner; ¼-in. pipe should be used.



A Handy Shop Lamp.

This lamp can be swung to any position, making it especially adapted to shop use.—

WHAT TO DO IN CASE OF INSENSIBILITY OR UNCONSCIOUSNESS.

Concussion or stunning, caused by blows or falls upon the head or fall upon the feet, may cause mental confusion for a time, and may be accompanied by laceration of brain substances with hemorrhage and clot.

Alcoholic intoxication closely resembles apoplexy. Every doubtful case should be treated the same as cases of apoplexy until the attending physician has decided which is the condition.

In all cases, before the arrival of a physician, it is safe to secure quiet and rest by laying the person flat upon the back, with the head a little raised; heat may be applied to the body if it should appear cold. If there should be great heat of the surface, especially during very hot weather, cold may be applied to the body and head, or the body rubbed with ice. Use no whisky or wines.

The cautious inhaling of smelling salts or hartshorn, followed by some warm drink, may be permitted, provided there is a long wait before the arrival of the physician. But all this must be done with care, with the head lifted up so that the patient may drink more readily, for in this condition the liquids are liable to enter the lungs instead of the stomach, if poured in too

ANOTHER PUMP-ROD FISHING DEVICE.

A description of another device for fishing broken pump rods is sent us by E. H. Harrison, of Dallas, Tex. He writes:

We have a well 1,230 ft. deep from which we have to pump our water, using a large lift pump. The rods are coupled together,

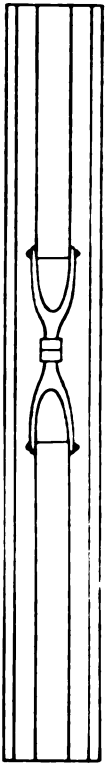


Fig. 1.

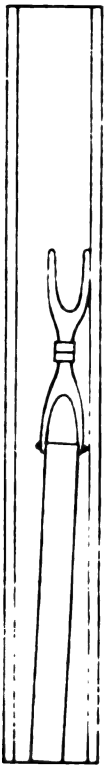


Fig. 3.

Fig. 5.

Fig. 2

with couplings as shown in Fig. 2, with the end of the rod put in the fork of the coupling and fastened there with brads, Fig. 1, and the couplings having male and female ends are screwed together.

Sometimes the rod pulls out of the fork leaving it in the shape shown at Fig. 3, with the fork against the side of the casing, making it very unhandy to get at. The cheapest and quickest method of fishing them out is as follows:

A fishing trap as in Fig. 4 is made, using 3-in. pipe, with a 2-in. slit about 4 ft. long in one side, with a steel dog on the opposite side to catch under the shoulder of the coupling. The slit in the pipe allows the fork to pass up the pipe far enough to allow the dog to catch under the shoulder of the coupling as in Fig. 5. Where the rod is broken the pipe without the slit is used.

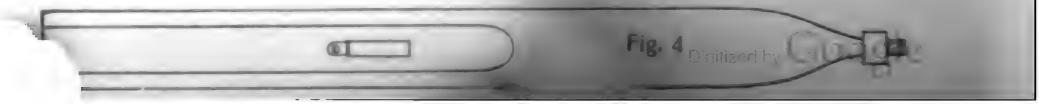


Fig. 4

BORING TENONS ON WAGON SPOKES.

Boring tenons on wagon spokes is a hard job where a common brace is used and one which requires a great deal of muscular power. Nearly every shop nowadays, however, is provided with an upright self-feed drill, which reduces the difficulties to a minimum.

To bore the tenons, make a small countersunk hole in the floor perfectly plumb under the drill shaft. Fit the spoke auger so it will run true and straight, put the wheel in place and proceed as though drilling a hole. The tenons will be perfectly straight and square with the wheel, every one alike, and the job done with no hard work.—Contributed by W. H. Raymond, New Sharon, Ia.

A GOOD CEMENT FOR CRACKED IRON POTS.

Knead 60 parts of clay and 10 parts of iron filings with linseed oil to make a thick paste. Add a little linseed oil just before applying and let it dry slowly. Will harden in two or three weeks.

OIL CEMENT FOR PORCELAIN.

Into 10 parts boiling linseed oil previously boiled stir 20 parts white lead and 12 white pipe clay. Knead the mass thoroughly. Let articles cemented stand several weeks to harden.

The height of a column of water in feet multiplied by .434 gives its pressure in pounds per square inch.

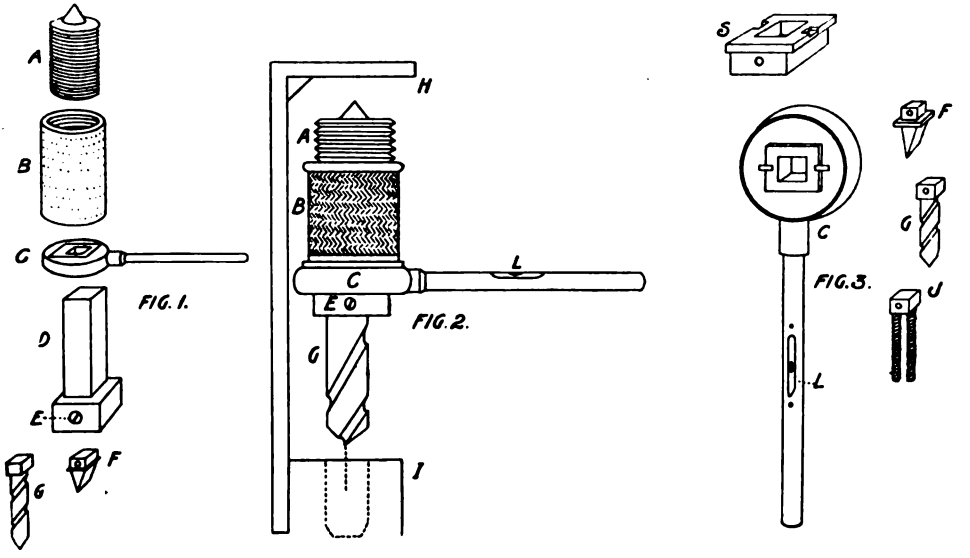
HOW TO BURN CHARCOAL.

First get good sound wood, black jack, black oak, elm, cedar, pine or walnut, and cut in four-foot sticks. Build a three-cornered pen out of wood eighteen inches across and about four feet high, says a writer in the Blacksmith and Wheelwright. Then begin to stack the wood on it and around the pen. Stack it close, and when you have a space large enough on top of the stacked wood, build the three-cornered pen higher. Then begin to stack short wood on its end until you can use long wood again, and so on. Then cover the wood with straw or hay about two inches deep. Have the straw even and as smooth as possible. Then begin to cover with dry dust and cover as thin with dirt as possible. Open a hole in the top of pit where the pen is and drop the pen full of chunks that are afire in order to start the pit to burning. Then make about five or eight holes at the bottom of the pit to give it air. Don't let it burn too fast. When it is well afire cover the top with short chunks, and straw and dirt; watch it closely. Punch a few small holes in the pit at the top to allow the smoke to come out. When the smoke is blue, stop the hole that the blue smoke is coming out of, and don't give it quite as much air at bottom through the air-holes.

As fast as the wood is burnt into coal next to the straw rake the straw out of the dirt and let the dirt to the coal, and when the to the coal and stop all the air-holes. The fire will then go out. Then draw out a little at a time and let the dirt still lay on the pit till it is all drawn. Coal is harder to burn under green dirt. It should burn about eight or ten days in a pit with one hundred bushels in it.

A HANDY RATCHET DRILL.

This handy ratchet drill is in six pieces and is shown in several combinations in Figs. 1, 2 and 3, in each of which the parts are correspondingly lettered as follows:



Handy Ratchet Drill.

A, feed screw; B, knurled feed; C, ratchet; D, chuck; E, set screw; F, screw driver bit; G, drill bit; H, rim of pulley; I, hub of pulley; L, level in handle of ratchet; S, bushing; J, tap.

The merit of this tool is in its great adaptability. Each piece fits snugly into its place. When used as a wrench or screw driver the tool may be used right or left-handed by turning the ratchet over. The handle may be taken out and used as a level; the bushings are in six sizes from ½ in. to 1 in.; screw driver bit, four sizes; tap, six sizes.

Such a tool made by a skilled workman from the proper materials would be a convenience hardly to be overestimated.—Contributed by Lee R. Clarke, Bozeman, Mont.

When an English journal tells about "petrol" it means gasoline; and "paraffin" is their way of saying kerosene, while spirits

HOOKS AND POWER TRANSMISSION.

A Study of the Weak Points and Their Remedies

The employment of hooks for wires, cables and certain types of coupled belt ends in power and transmission is much more common than formerly. Hooks are very convenient for the purpose of unclasping the drive temporarily, and various designs of them are in use. The sketches herewith explain some of the points relating to their use. The hook shown in Fig. 1 is one of the usual type employed for joining any two ends of cable, endless chain system or belting arrangement in drives. The hook is found designed in several ways. Possibly the weakest type is that as exhibited, for the reason that there is a lack of ample bulk of metal at the point B where excessive strain occurs when the hook is drawn by the coupled parts. The hook circle at A may be properly described and a secure style of oval obtained for locking, but the shoulder portion at B, where the part is reduced in size, is fatal. To overcome this defect it is customary, therefore, to use hooks in drives in which the back of the hook at the point B is described in larger proportions by using a surplus of material, thus assuring great resisting power. Then, again, in many of the patterns of hooks in use in belt drives of smaller proportions, the simple line of wire seems in vogue, resulting in the describing of a hook circle like that shown in Fig. 2. This type of hook is faulty. The least undue strain in the cable system is likely to pull the hook open and perhaps fracture it, as at C. The hook in its original form is shown in Fig. 3. Its weak point is at D.

Hooks manufactured on the order shown in Fig. 4 may be found in practical service in rope and other descriptions of driving systems. This form of hook is made with a view of having strength in the back of the hook, but the shaft, F, is neglected. The result is that whenever any unusual strain exists, the chances are that the hook shaft will break off at this juncture and the combination be rendered non-effective. In order to avoid this trouble, many power and transmission engineers have the hooks made on the eye-plan, as shown in Fig. 5. Then when the draft of the coupling on G occurs, there is opportunity for the hook shafts to grip themselves, as each end is locked in with the nuts as shown. This makes quite a positive union. It is one that can be opened readily in case it is necessary to remove the link G. It is customary to wind these nuts with wire binding so as to make them pass through the wheel grooves if used in that form. Usually, however, the hooked ends are employed only on sprocket systems, for elevating weights, where speed is slow and the opportunities for traveling of bulky parts ample. These styles of hooks may also be seen in use for supporting parts of the cable drives. The employment of guides, idlers, etc., all call for some kind of a supporting system, and often the journals are hung by means of hooks produced along the lines of the drawings. In the running

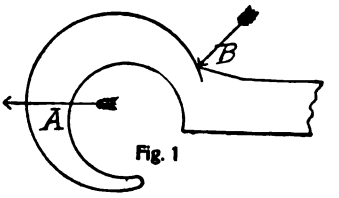


Fig. 1

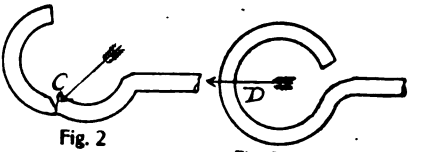


Fig. 2

Fig. 3

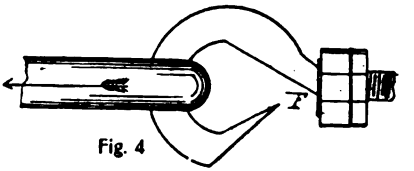


Fig. 4

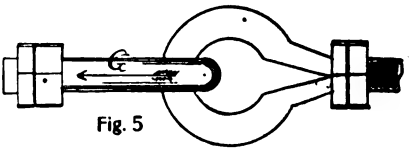


Fig. 5

system, however, it is desirable that the joints of all connections be as rounded and smooth as possible. Fig. 6 illustrates one style of connection for a drive in which coal is moved from point to point by a conveyor system. Where a joint occurs, the union is made by interlocking the split hook shaft into the formed or solid link or eye, and then the divided portions of the former were locked by binding with wire, as at H. These bindings serve to retain the sides securely and make quite a firm connection, so long as the wire lasts. It seems, however, that the wire needs constant attention, for as soon as it becomes worn and

weak it is liable to fracture, thus permitting the parts to open and releasing the union.

In most drives the socket system is preferred. The other forms are chiefly patched work, seen in miscellaneous shops, and used for slow drives under special conditions. The socket plan is next described. The caps may be made in halves, one side being arranged to lock with the other, as by the

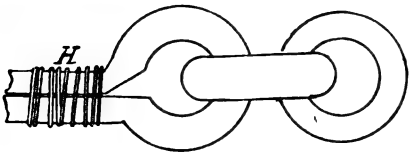


Fig. 6

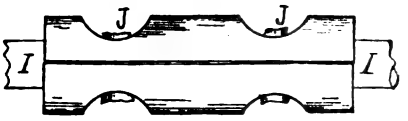


Fig. 7

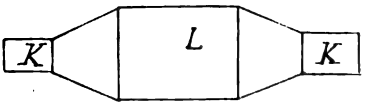


Fig. 8

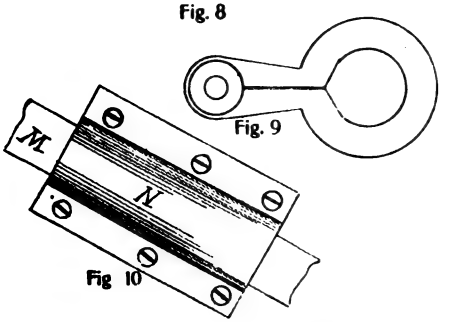


Fig. 9

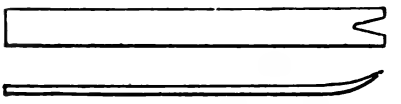
Fig 10

use of rivets, Fig. 7 at J, J, or by brazing into the stubs and locking with other devices. The sockets are often welded and bored for the rivets. Sometimes they are cast in molds. Some are iron and others brass or other metal. Copper is used now and then. The cable ends are inserted into the hollows, and as the inner sides of the parts are grooved around the circle, when the sides are tightly closed, there is a tendency to bite the cable of wire or rope quite securely, so that when a good joint is made, the cable ends remain intact under heavy strain. This manner of uniting the ends is useful for guide ropes or cables for wheel belt shifters when the shifter is up above one or two floors and a long shifter rope is needed. The ends of the cable inserted into the locking sides are marked I, I. In Fig. 8 is shown the socket which is cast like L with tapered ends. The parts K, K represent the cable placed within the shoulder coupling. The ends are introduced from either side and they meet in the center. Then the soft metal is compressed in a specially prepared apparatus and the roughened interior surfacing so securely bites the wire or rope that a very strong union results. The form of link for locking with a cable hook or corresponding part, shown in Fig. 9, is also in use. This style of locking eye is made by turning the ring on a stub and uniting the ends as shown. There is a chance left at the jointed ends to insert a bearing clasp by which union is made with any desired connection.

One also sees the common type of screw-fitted clasping sides, as in Fig. 10. This consists of two portions, each portion being shaped like box caps, and the caps are placed together and either united by means of screws or by bolts with nuts. Sometimes rivets are utilized and the rivets are headed up. The letter N designates one of the caps and M the inserted cable end. This is for uniting parts which do not pass in grooves.—Contributed by "R."

A TOOL FOR PULLING STAPLES.

Draw a piece of steel, an old rasp, or something of the same size, to the shape of a thin chisel. With a chisel cut a claw about 1½ in. long and shaped like the claw



Tool for Pulling Staples.

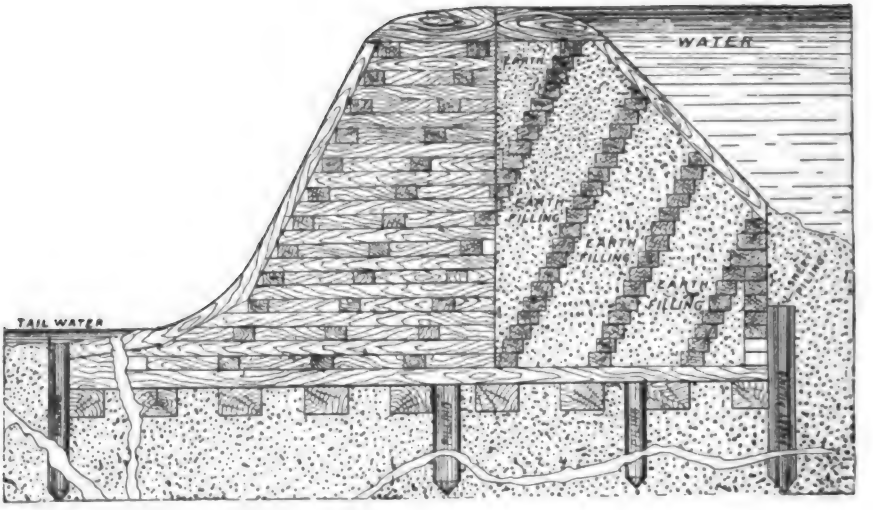
of a hammer. The bend of the claw is shown in the illustration. This is a good staple puller, says the Blacksmith and Wheelwright, but does not save the staples.

USES A POCKET MIRROR.

"In doing some kinds of work one is sometimes obliged to get down on his back to put in a screw or to see that everything is right," writes one of our readers, "for this purpose I often use a small pocket mirror having a handle and joint for turning it to any position."

EARTH AND TIMBER DAM ON SANDY FOUNDATION.

An earth and timber dam involving no special engineering problems and which is rightly put in, will stand for generations. In sections where timber is still plentiful, this principle can easily and profitably be applied to many different uses, such as wing walls and re-enforcements for waterways and race banks.



Construction of Dam on Sandy Foundation.

specially adapted for use on a sand foundation is shown in the cut. A writer in the American Miller says:

A peculiar feature of this dam lies in its circular construction and earth filling, making an earth dam, held together by timbers laid up, for all the world, like a laminated wheat bin. Each cell is 5 feet by 5 feet, and the earth is tamped in as the dam is raised a foot or two, a stream of water pouring into the cell during the operation.

It will be noticed that the cells are not perpendicular, but lean at an angle toward the upstream of the dam. This is intended to act as a brace to the structure and avoids getting the spikes too close together in the cross timbers. No attempt is made to have the planking on the upstream side watertight, but that on the downstream side is very carefully and strongly laid so that no water escapes and that it cannot be torn off by ice. The capillary action of the earth filling is depended on to keep the cell timbers wet and away from the air so they will not decay.

While this particular dam, which is 700 feet long and 19 feet high, cost about $80,000, others on the same principle, but differently located, need not cost much more, if any, than an ordinary timber dam. But it represents one of the best types of modern dam construction for sandy bottoms, and, if

COMPRESSED AIR FOR CLEANING BOILER TUBES.

Compressed air works like a charm for cleaning boiler tubes, leaving them as clean as on the day they were put in. This is the verdict of a correspondent of the Engineer, who had formerly used steam hose for this purpose, but upon the installation in the plant of a large air compressor for pumping water, tried the compressed air method.

The air pressure was about 200 lbs. per square inch, and the rest of the apparatus consisted of a ¾-in. hose with a straight piece of ¾-in. pipe for the nozzle.

BLACK WATERPROOF DRESSING.

Mix together 7 lb. best black paint, ½ lb. powdered litharge, 1 pt. oak varnish, ½ pt. boiled linseed oil, ½ pt. thick boiled oil. Apply as ordinary paint. This dries sharp with a good gloss, says the Master Painter, and is durable and elastic. Especially good for railway and wagon covers, tarpaulin and such purposes.

The steam yacht "Arrow" has a record of 42 miles an hour—the fastest time ever made on water.

TOOL FOR CLOSING CAR DOORS.

Shippers, in particular, will appreciate the simple tool shown in our illustration. Many car doors made, apparently, to close by hydraulic power, refuse to work properly at the critical moment and cause any amount of annoyance and delay—then is the time when the tool is handy. Fig. 1 shows the two parts which any blacksmith can make. A is a piece of 1-in. drawn shafting, flattened at one end, making a rather prominent chisel-shaped hook on end C, which should be hardened, as some doors are iron-bound.

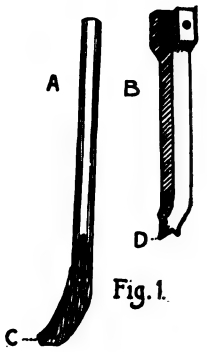


Fig. 1.

B is the leg or brace which must have a very sharp point on end D, with shoulders as shown to prevent burying too deeply in side of car. Fig. 2 shows the tool put together.

A (Fig. 1) is 3 ft. long; B is 2 in. Hole for bolt should be about 6 in. from end, or two or more holes can be bored. Fig. 3 shows how tool is used having a ratchet

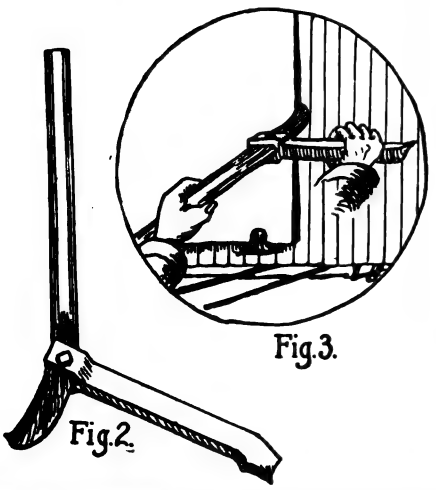


Fig. 3.

Fig. 2.

effect by working the bar back and forth and pressing leg firmly up against car.—Contributed by S. J. Hoag, Jonesville, Mich.

The diameter of a piston squared and multiplied by .7854 gives its area.

PORTABLE ELECTRIC PLANER.

An electric railway in California which had occasion to plane several hundred wooden trolley poles, and found it difficult and expensive to haul the poles to a mill, built a home-made portable electric planer as shown in the illustration.

It consisted of a planer head mounted on a substantial wooden truck and belt-driven by a 5-horsepower 500-volt direct-current General Electric motor. The rollers were made of two sections of 10-inch wrought-iron pipe, castings being fitted in the ends for the axle bearings. A pair of plow handles were used to push and guide the planer, the starting box for the motor being mounted between the handles, as shown. The entire outfit cost but $60 outside of the motor, which the company had in stock. The poles were 35 feet in length, with 8-inch tops, and it took about one minute to plane down one of the four sides of a pole. The poles were planed as they were unloaded from the cars, at the

Handy Portable Electric Planer

rate of six poles an hour. There was not only considerable saving in time, but also a great saving in expense, as it cost but ten cents per pole as against $1.15, the price estimated for doing it by hand.

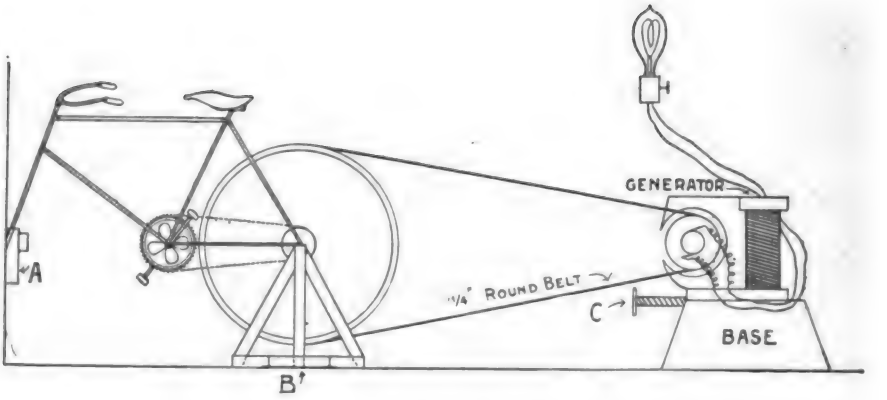
A good imitation mahogany stain consists of 1 part Venetian red and 2 parts yellow lead mixed with thin glue size and laid on with woolen cloth.

RUNNING A GENERATOR WITH A BICYCLE.

One of our readers, W. J. Slattery, of Emsworth, Pa., uses an old bicycle for running a small 10-volt generator; he says:

"The front forks of the wheel are securely braced to the wall and the back forks are then braced up so as to have the back wheel clear the floor about 3 in. The generator is set 5 or 6 ft. distant. To keep the belt tight a sliding brace can be made and worked by a screw.

"I have one of these rigged up and it is just the thing for charging small storage batteries, running small motor and for all experimental purposes where light power is required for a short time."

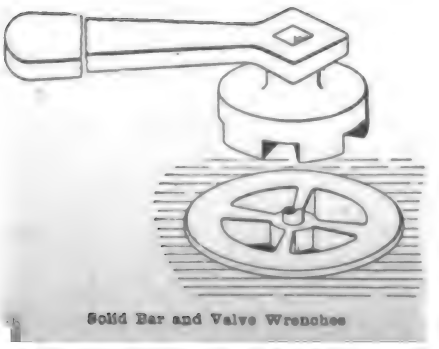


Running a 10-Volt Generator with a Bicycle

METHOD OF REMOVING BROKEN PUMP-VALVE SEAT.

A solid bar wrench fitted over the head of a valve wrench was the instrument used by a correspondent of the Engineer for taking out a valve seat in which the guard stem had been twisted off. As only one hand could be got into the chamber at a time it was impossible to drill or chip it out. The valve was in the suction chamber of a triple compound direct acting pump with 15 x 24 inch water plungers. The broken valve seat was in the lower left-hand corner and could not be pulled with a wrench.

The combination instrument, however, worked amazingly well.

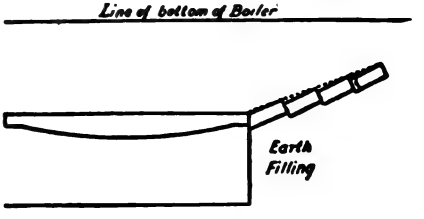


Solid Bar and Valve Wrenches

The machinist blocked up against the handle of the wrench with a 4 x 4 pine block, which extended through one of the hand-holes far enough so that he could put the cap of a jackscrew against the heavy brick wall. He then slowly turned the screw. In a few minutes he was rewarded with the loosening of the valve seat. Upon taking it out he drilled out the old guard stem and fitted another, and put the seat back in place again.

BRIDGEWALL FOR WOOD FUEL.

The accompanying sketch is used by a writer in the Wood-Worker to show how brick is placed on a bridgewall to prevent wood from dislodging it when firing.



For Wood Fuel

The front end of the brick, being below the back end of the row in front, prevents the ends being caught and loosened by passing wood over them.

About twice a year evaporating tests, to determine the efficiency of the boiler, should be made. This does not require an expert.

A KINK FOR THE PLANER.

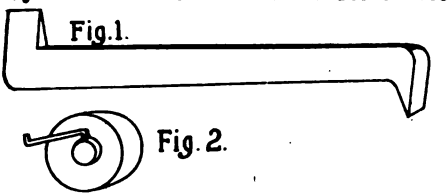
We have a considerable number of plates about 2 feet by 3 feet by ¾ inch to plane. A great many of them are warped so they will not lay flat on the four planer blocks we have and with these warped plates considerable time was lost in hunting sheet iron bushings, etc., to shim up with.

To remedy this I had four more blocks cast, just like the ones we had with the exception of a lug put on them at c. This lug was tapped for a ½-inch set screw which allows for enough adjustment to accommodate all warpage.

With this simple device the plate could be set up in half the time ordinarily used in shimming up with bushings. The bushings were a nuisance, also, for they frequently dropped out.—Norman, Muscatine, Iowa.

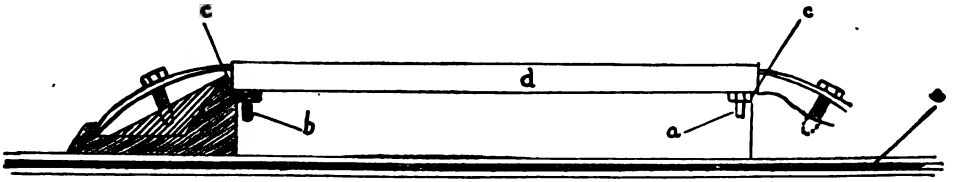
SCREW DRIVER FOR SET SCREWS.

The accompanying illustration shows a handy form of screw driver for use on set



screws. Fig. 1 shows the shape of the tool, while Fig. 2 shows its position when in use. —Contributed by Lee R. Clarke, Bozeman, Mont.

One cubic foot of steam is produced from one cubic inch of water evaporated under ordinary atmospheric pressure.



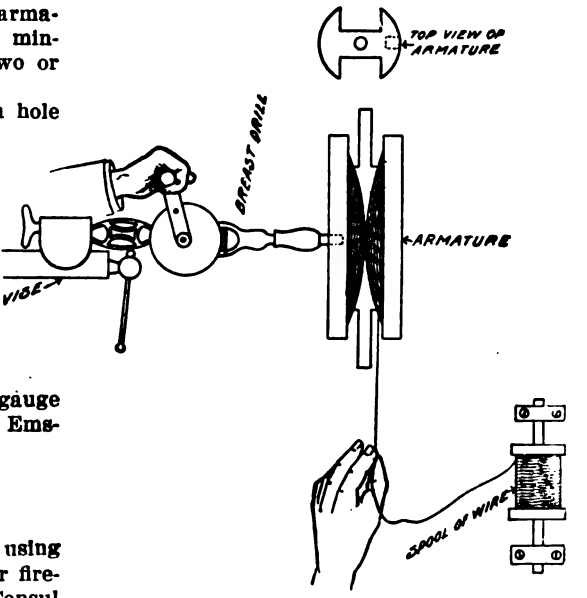
A Kink for the Planer.

How to Wind a Magneto Armature.

By the following method a magneto armature may be wound in from 15 to 20 minutes, when by hand it would take two or three hours.

Usually the armature already has a hole tapped in it where it was fastened on the coil-winding machine in the factory, where it was first wound. At this hole hasten it on the chuck of a Miller's Falls breast drill with a piece of wood and then put in a vise as shown in sketch.

Put the reel of wire on a spindle so it will revolve as the wire is wound on the armature. Have a friend turn the drill while you guide the wire. Use No. 40 B & S gauge wire.—Contributed by W. J. Slattery, Emsworth, Pa.



Winding a Magneto Armature.

FIREPROOFING CLOTH.

Dyers at Manchester, England, are using titanic acid (the oxide of titanium) for fireproofing cloth, reports United States Consul Frank W. Mahin of Nottingham, England. Cloth treated with this acid was demonstrated to be non-inflammable. When touched with a lighted match the fire smoldered and went out. It is claimed that dyeing, boiling or washing will not remove the acid.

AUTOMATIC SHUT-OFF FOR A PRIVATE COAL BIN.

An automatic shut-off for a private coal bin will be found a great convenience and is one which may be easily constructed by any man or boy.

The bottom of the bin is constructed so as to convey the coal to the spout. When not in use the spout takes the position shown in Fig. 1. When coal is to be taken from the bin all one has to do is to press down the spout until the lever L (Fig. 2) drops and catches it by the pin P, which holds it down for the coal to run out.

The pail which catches the coal is placed on a stand which acts as a lever D. (Fig. 2). On the end of this lever is a weight, W, made in the form of a box so that when

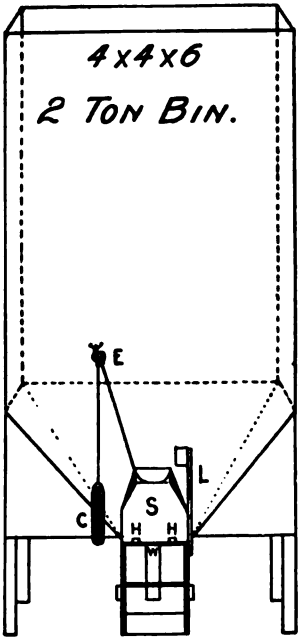


Fig. 1.
FRONT VIEW

a pail of larger capacity is to be filled the weight can be increased, or vice versa. When the pail is full of coal it over-balances the weight and causes the bar, F, to turn forward, thereby striking the lever and releasing the spout, which flies upward (impelled by the weight C, Fig. 2), and so shut off the coal.

The action of this coal bin is not only simple, but in all cases certain, unless clogged or otherwise out of order. This makes it very convenient for the person not

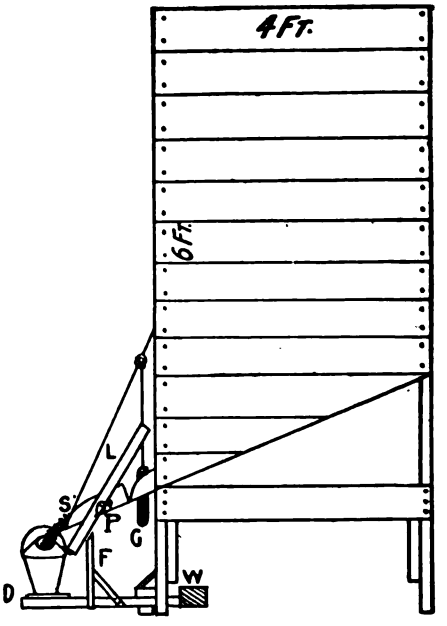


Fig. 2.
SIDE VIEW

desiring to use a fire shovel in zero weather. —Contributed by F. Blessin, Eldorado, Ia.

HOW TO MAKE A WOODEN AXLE.

Select a piece of wood of the proper size, find the center and draw a chalk line on all four sides the whole length, as at A, Fig. 1. The end view (Fig. 1) shows a gauge mark across it. If the wheels have an inch dish, measure 7-16 in. down from the horizontal line and 1-16 in. in front of the perpendicular line, stick dividers in the dot and strike a circle as large as the outer end of the journal is to be (end view, Fig.

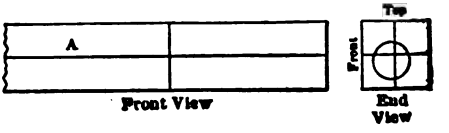


Fig. 1

1). With the square draw a line on all four sides of the circle and from these draw lines to the collar (B, Fig. 2.)

Draw a line, C, across the center of the circle, and from point to center line at the collar. D is the square of the center line of the arm. To get the collar squares, mark

out to one side from the center, reverse the square and get the line all around.

To cut the top and bottom off, strike the end all out and cut off the front and back

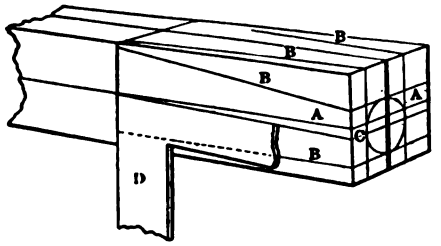


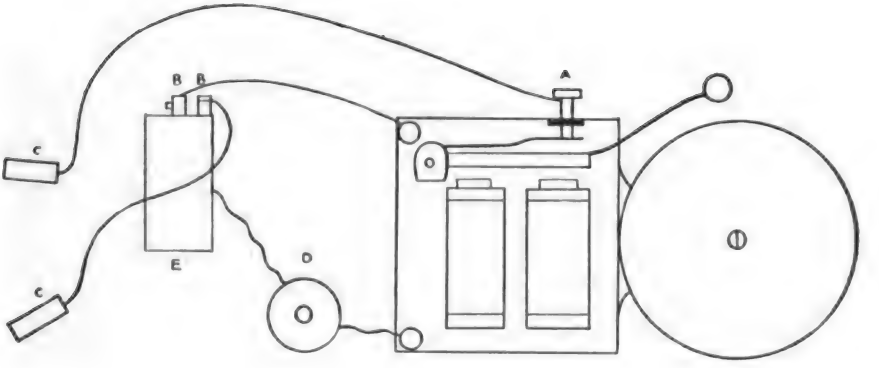
Fig. 2.

sides. The arm is then the right size and set right. Make it 8 in. square and round it up. A correspondent of the Blacksmith and Wheelwright, who describes this method, says he usually puts steel skeins on the bottom.

ANOTHER SHOCKING MACHINE.

The shocking machine shown in the sketch is very easy to rig up and will produce the same results as an expensive machine.

Take an ordinary bell outfit. Connect up the bell. Attach an extra wire to A, which is a regulating screw. To B on the battery attach another wire the same as to A. To the free end of these wires attach a small piece of iron. Grasp an iron in each



Home-Made Shocking Machine.

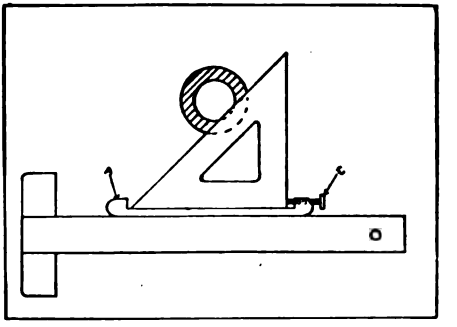
hand and have a friend turn on the bell. As the friend makes the connection you will receive a delightful shock. To intensify the shock, plunge C into a pan of water, grasp F in one hand and place the tips of the fingers of the free hand in the pan of water and proceed as before.—Contributed by Geo. Frye, 903 Vine St., San Jose, Cal.

Points in Diagram: A—Regulating screw. B—Set-screw on battery. C—Handle. D—Push-button. E—Battery. F—Same as C.

DEVICE FOR SECTION RULING.

The little contrivance here shown, I have found very convenient in section ruling, writes Signa L. Hatfield, of Wagoner, I. T.

Little explanation is needed. A is made of wood or other suitable material about ⅛ in. thick (I have used cigar-box material). The notch cut out is slightly (say ¼ in.) longer than the triangle which is to be used in it. Placing the device as



Device for Section Ruling.

shown in the sketch the spaces between lines may be made very regular. Draw a line along the triangle, and then holding the triangle stationary slide the device as far as it will go to the right, then slide the triangle until it strikes the adjusting screw, when it will be in position for making the next line. The adjusting screw, C, makes it possible to vary the space between lines. The head of this screw should be filed off on the sides until one dimension of the head is the same as the thickness of the wood.

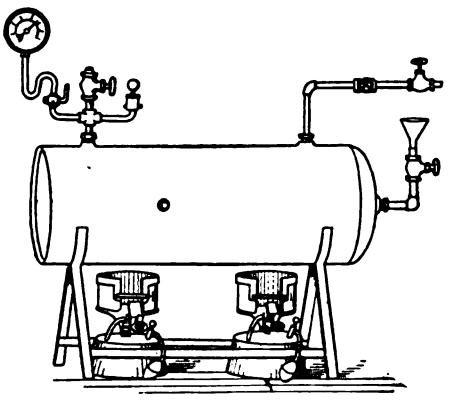
REMOVING VARNISH STAINS.

To remove resin, varnish or sealing-wax stains from fabrics, warm and apply strong methylated spirits. In rubbing the material apply the friction the way of the stuff, or a rough spot will be left.

THAWING UNDERGROUND FROZEN WATER SERVICE PIPES.

Thawing underground pipes is one of the plumber's hardest problems at this season when the pipe is sometimes frozen from the cellar wall to the main in the street and thus very difficult to get at. The machine shown in our illustration was devised by a correspondent of the Metal Worker just for this purpose, and will open any job on a straight line.

It consists of an ordinary 15-gal, expansion tank resting horizontally on legs made from the band iron taken from bundles of sheet iron. In one of the openings intended for the water gauge is a short nipple and a ½-inch cross. On one side of this cross



For Thawing Underground Service Pipes

is an ordinary steam gauge to register 35 lbs., and on the other side is an ordinary safety valve, set to blow off at 30 lbs., for safety. On the top of the cross is a nipple and a gate valve to let out the air when filling the boiler with water. In the other water gauge opening there is a ½-in. nipple and a ½ x ¼-in. reducing elbow, with a short nipple, and a swinging check valve, then another nipple and a ¼-in. gate valve. This is where the steam supply is taken from. In one end of the boiler is an elbow and a short nipple and a ½-in. gate valve with a tin funnel on the top to fill the boiler with water. The other openings are plugged.

To put this apparatus in operation put two pailfuls of water—hot, if possible—into the boiler, and with two good gasoline furnaces under the boiler run the steam up to 25-lb. pressure. On a ¾-in. service pipe use a coil of pure tin pipe for tubing, 75 ft. long, with a ¼-in. brass coupling soldered on one end to fasten about 10 ft. of ½-in. hose for steam. On the other end attach a union for connection to the ¼-in. valve on the boiler. Unroll 15 to 20 ft. from the other end of the tin pipe and push it in the service pipe until it strikes the ice. Then everything is ready for the steam to be turned on slowly, and soon the hot water and steam will be seen returning; but it is necessary to keep pushing the tubing into the pipe as fast as the ice melts, for if it is not kept well up to the ice it will not thaw, even if only 6 in. from the ice. In fact, it works decidedly better if it be kept against the ice in the pipe all the time. The tin tubing should have a ¼-in. opening, leaving plenty of space around it for steam and water to return.

A good round way stop or gate valve should be placed on the end of the pipe before starting, to avoid receiving a bath before it can be put on after the pipe is opened. When the water starts, have the helper pull the pipe out as quickly as possible and close the stop valve, when the job is completed without much trouble. If the water in the boiler gets low, which can be told by the steam suddenly dropping off, exhaust the steam in the boiler into a bucket of water and then empty the water into the boiler. This will warm the water that is to enter the boiler and aid in getting up steam again quickly. With this outfit its inventor has opened 86 ft. of ¾-in. service pipe in the ground in three hours' time without a helper, and the service seemed to be frozen solid.

When using it outside of a building three furnaces and a sheet iron jacket to keep off the wind may be used. This machine is cheap to rig up and successful in operation.

SPLIT NUTS IN DRIVING THREADED WORK.

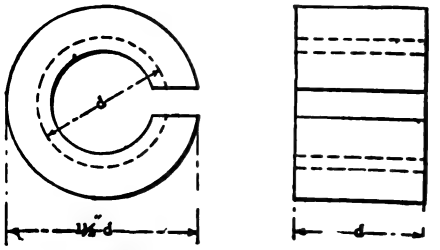
It is not good practice to use a nut with a saw slit in one side for threaded work, especially if it will not come off easily. If a cold chisel is driven in the slot to ease it, this soon results in a halved nut which is even more difficult to handle.

The split nut shown in the sketch is original with a correspondent of the American Machinist, who says he has used a set of 13 such, ¼ to 1 in., constantly for several years and finds them both cheap and effective.

They are made of cast steel, tapped to a full thread and turned concentric with the threaded hole. The length =d= the diameter of the tap, and the outside diameter of the nut = 1½ × d. After the slots are cut, the nuts are opened a trifle with a

chisel, to insure their being turned on freely by the fingers after hardening. It takes but a jiffy to spin them on. They are hardened in oil and given a spring temper by burning off the oil.

A common lathe dog or a 3-jawed chuck



Split Nut for Threaded Work

closes them on to a thread very firmly. A set takes up a space of 1 in. by 8¼ in. placed tandem, with the slots over a narrow upright strip of brass.

LIGHTING DEVICE FOR STONE CUTTERS AND OTHER CRAFTSMEN.

Portable electric lights are now used by many stone cutters who require good light for granite and marble lettering, says the Monumental News. As the work proceeds the light must be moved to many different positions and with the ordinary light it is

Portable Electric Light for Close Work

hard to keep the shadow from falling on the stone.

The light may be satisfactorily arranged, where electric lights are used, in the manner shown in the sketch. A wire guard protects the lamp against breaking and a strap is convenient for fastening it to the head. This arrangement causes the least bother and gives a light equal to the best daylight.

A good plumbers' cement consists of 1 part of black rosin melted, to which is added 2 parts of brickdust, finely powdered and thoroughly dried.

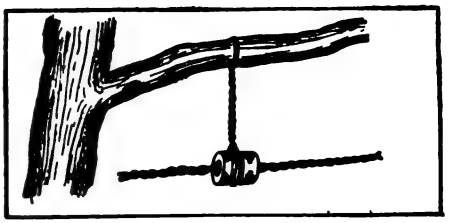
HOW TO BRONZE CAST IRON.

The Maschinenbauer describes the following process for imparting to common cast iron all the rich glow of bronze, without covering it with a metal or an alloy. Having thoroughly cleansed the surface and rubbed it down smooth, apply evenly a coat of vegetable oil, say sweet or olive oil, and heat the iron object, being careful that the temperature does not rise high enough to burn the oil. At the moment of decomposition of the oil the cast iron will absorb oxygen, and this forms upon the surface a brown oxide skin or film, which takes a fast hold and is so hard that it will admit of a high polish, thus bestowing upon the iron a striking resemblance to bronze.

SUSPENDING WIRES TO TREES.

In constructing telephone lines it is frequently desirable to suspend a wire to a tree. The American Telephone Journal gives the proper method of doing this.

The twisted wire is run through an insulator suspended from a limb as shown in



Insulated Suspension for Telephone Line

the sketch. If the wire were fastened directly to the tree the tree would sway with the wind and the wire might break. The insulator affords a flexible support which holds the wire in place without regard to the motion of the tree.

Often, when in need of a flat pulley, only a crown pulley will present itself. Now, we all know of several ways to crown a flat pulley, but when a friend of mine proceded to flatten a crown pulley (wood) with a rasp, the obvious simplicity of the thing almost killed father, says a correspondent of the American Machinist.

To make paint stick to tinware scratch the surface of the tin with a piece of rough pumice or sandpaper, apply a coat of thin shellac varnish and then paint of the desired color. This will prevent the paint from shelling off.

HOW TO MAKE YOUR CLOCK START FIRES FOR YOU.

BY WM. H. MATTHEWS.

You must have an eight-day clock or one which has an alarm that is wound from the outside of the clock.

Get an empty spool, A (Fig. 2); saw a groove in it on one end, B; attach a string, F, with a short piece of wire attached to the loose end, E. The string should be about 16 in. long.

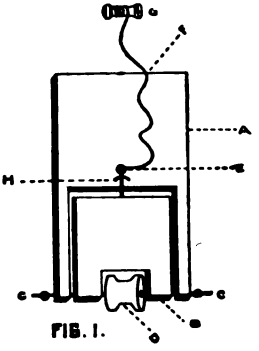


FIG. 1.

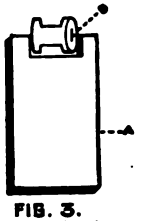


FIG. 3.

Get a piece of white pine about ½ in. thick, 6 in. wide and 16 in. long, A (Fig. 1); saw a piece out of one end of it as shown. The piece sawed out should be 4 in. by 5 in. Take the piece you sawed out and cut off about ¼ in. on one side and put it back from where it was taken; but before doing this, cut a small place in one end of this piece so that an empty spool can turn easily in it. (See D in Fig. 1.) Run a long wire, C, through the piece, A, and also through B, and the spool, D. This will make a trapdoor that will drop when the string F is wound on to spool, G, and the piece of wire, E, is withdrawn from under B when the alarm runs down. A close study of Fig. 1 will show you exactly how to make this part of the apparatus.

Take a heavy piece of wood, A (Fig. 3), and cut a piece out of one end and mount a spool in this place so it will turn easily (B, Fig. 3).

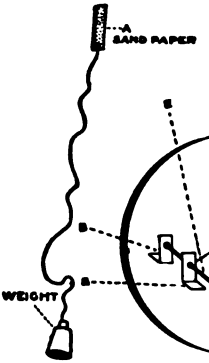


FIG. 5.
STRING WITH SAND PAPER ATTACHED AND WEIGHT ALSO

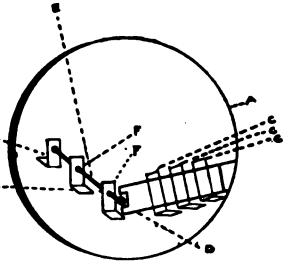


FIG. 4.

For the fire starting apparatus, procure a piece of tin; either a round or square piece will do. The top of a 10-pound lard bucket is just the thing. Fig. 4 shows how this is made. Take an old chisel and cut three pieces B, B, B. They must not be cut clear out of the tin but cut only on three sides. These pieces, B, B, B, must be bent upward to hold the match, E, They should be about 1½ in. high and about ½ in. wide. Make a hole in the two front pieces, B, B, large enough to let a match slip through easily. The last piece, B, should not have a hole in it. Take a piece of old rusty water bucket hoop about 6 or 8 in. long and cut a small notch in one end so that it will pass the head of the match, E. Then cut several (three will do) pieces of tin and bend them up, C, C, C, and over the spring and so mount it that it will press tolerably hard against the head of the match, E. All that now remains to be done is to take a piece of sandpaper about 1 in. wide and 4 or 5 in. long; tie a strong cord long enough to reach from the machine (Fig. 4) out to Fig. 3, which should be placed on the floor in front of fireplace and up to trapdoor, which is laid on the mantel with the clock placed on top of it. A weight should be attached to the other end of this cord. (See Fig. 3.) A small sack of sand is best for the weight.

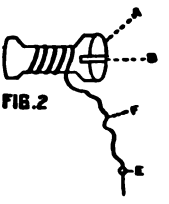


FIG. 2.

Now to put the fire-starter in operation. At night before retiring let the fire burn down low. Cover the coals after raking them to the back of the fireplace. Put on your wood. Take your fire-starter (Fig. 4) and place a match, E, through holes F, F, with the head next to spring, D. Place the sandpaper, A (Fig. 5), between the match and the spring, D, with the paper projecting toward rear of fireplace. Put Fig. 4 between the fire-dogs and run the string attached to the sandpaper over spool, B (Fig. 3) and on up to trapdoor, B (Fig. 1). Insert wire, E (Fig. 1), under trapdoor, B, and lay the weight on trapdoor. Wind your alarm and push spool G (Fig. 1), on the thumbpiece that winds the alarm. Set your alarm for any hour, and when it rings the string will wind onto the spool and pull the wire from under trapdoor. The weight will fall and jerk the sandpaper from

between the match and spring and strike it, starting a fire. Be sure to have a notch in the spring so that it will pass the head of match, or it will put out the match when struck. Lay something that is easily burned close to the head of match to start the fire. Excelsior and paper are both good.

This is a good thing for a lazy man and costs nothing to make. I used such an apparatus several winters, and it is nice to have a warm fire to get up by. If you do not wish to attach it to your clock, run the string to your bed and pull it and start the fire yourself.

HOW TO MAKE AN AUTOMATIC FURNACE TENDER.

It is a simple matter to make a device which will open the furnace dampers at any desired hour day or night. It is particularly desirable for use in early morning in order that the house may be warm before getting-up time. The instructions are by a correspondent of the Metal Worker.

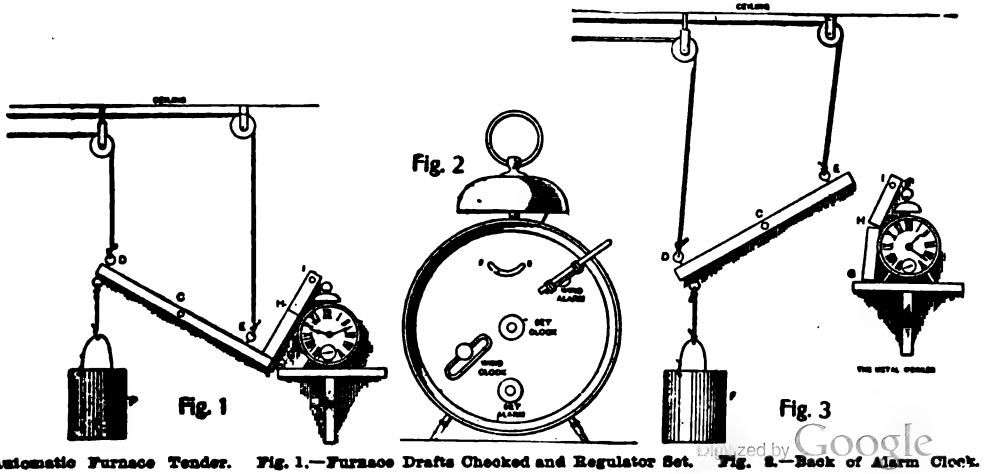
Most furnaces have two draft doors, a check draft at the back and a draft door, or lid, in front. When the furnace is checked the door in front is closed and the rear draft is open, allowing air from the cellar to go into the chimney without passing through the furnace. When the furnace is burning the rear draft is closed and the front one open, forcing the air to go through the grate to reach the chimney. The simple device illustrated will permit the draft to be shut off as desired, while a common alarm clock will close the check draft and open the front draft at any hour desired. Pulleys must be screwed into the ceiling, as shown in Fig. 1. Fine rope leads from the check draft to the end of the lever E and from the front draft to the end D. A hard wood stick 12 in. long is shown by D, C, E working loosely on a screw, C, driven into the wall or other convenient support. F is a weight, consisting of an empty tomato can, into which coal can be put until it is just heavy enough to operate the drafts.

To check the furnace the end E is drawn down, as shown in Fig. 1, raising the check draft and allowing the front draft to close of its own weight. The end E is held down by a lever, G H I, hinged in the middle on the bottom side and fastened to the wall by a screw at I, on which it works loosely. The alarm clock, Fig. 2, is set to go off at any desired time and is placed on a shelf, so that when the alarm goes off the winding lever for the alarm, which has been lengthened by binding a piece of hard wood, strikes the hinged lever from below at H, bending it up so that it flies out of the way, releasing the end E of the solid lever. The weight F then falls, as in Fig. 3, opening the front draft and allowing the check draft to close of its own weight.

PACKING FLANGE JOINTS WITH ASBESTOS

For packing flange joints, a correspondent of the Engineer claims that thin sheet asbestos (wet) is far ahead of the best rubber, if a permanent joint is required, though a rubber gasket can be put on much more quickly and easily.

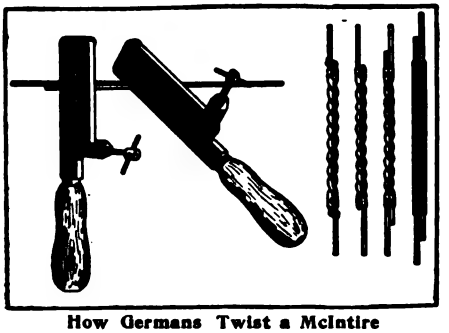
Great care is necessary in handling the wet asbestos, but if the joint is well made with very thin sheet asbestos and the flanges are in good condition, it will stand several hundred pounds pressure.



Automatic Furnace Tender. Fig. 1.—Furnace Drafts Checked and Regulator Set. Fig. 2.—Back of Alarm Clock.

TWISTING A "McINTIRE JOINT" IN GERMANY

American linemen use only a pair of pocket pliers for twisting up a McIntire joint, says the American Telephone Journal, but in Germany the linemen have a pair of clamps especially for the purpose. These



How Germans Twist a McIntire

clamps resemble nut crackers somewhat, but have a number of slots fitting the different sizes of McIntire joints it may be necessary to make. Each clamp has a handle and a set screw by means of which its jaws are fastened about the sleeve to be twisted. With the sleeve in position and the two clamps applied the joint is made by revolving the handles in opposite directions.

AN EMERGENCY WATER FEED

The shop was away out in the woods; the boiler an upright and the engine a 5x12-in. The injector went all to pieces one afternoon and they had no pump. Most people would have shut down and waited till a new injector could be telegraphed for and received. This is what the engineer did. There was a piece of five-inch gaspipe under the bench; it happened to be about three feet long and threaded at each end. Caps were screwed on and one end connected by way of a one-inch pipe to the feed-pipe. This one-inch pipe was long enough to raise the five-inch length above the top of the boiler. The upper end was provided with a short length of one-inch pipe provided with a globe valve and ending in a funnel. This end was also connected with the steam space by a half-inch pipe running into the hole lately occupied by the third water-gauge cock. The shop started at seven the next morning and for four days that boiler was fed by gravity. The valve in the steam pipe and in the one-inch pipe below the five-inch piece would be closed; the big pipe filled through the funnel; its valve would then be shut, the others opened and down would go the water into the boiler. Of course it made hard work lugging water up a ladder in pails all day, but the engine kept turning.

GLUES FOR RESISTING DAMP

1. Prepare ordinary glue with boiled linseed oil.

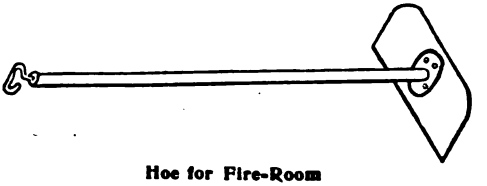
2. Melt 1 lb. glue in 2 qt. skimmed milk; shellac, 4 oz.; borax, 1 oz. Boil in a little water and concentrate to a paste by heat.

TO MAKE PAINT ADHERE TO GALVANIZED IRON

In painting galvanized iron apply first a solution of ammonia water, using a whitewash brush to put it on with. Allow this to dry before applying the paint, says a correspondent of the Metal Worker, and there will be no difficulty about the paint adhering to the iron.

HOW TO MAKE A HOE FOR THE FIRE-ROOM

A hoe much better adapted to the dimensions of the boiler and the kind of fire carried can be made at home rather than bought, says Power. To make such a hoe, rivet a ¾-in. malleable railing flange on to a piece of iron, 3-16x6½x13 in. Screw in a



Hoe for Fire-Room

piece of pipe of the proper length, and fit the other end of the pipe with a piece of iron bent as shown in the illustration. This can be put on by means of a reducing coupling.

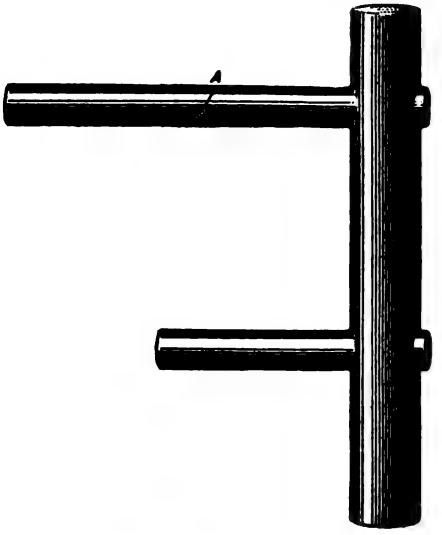
A machine for keeping the smoke tubes of marine or stationary boilers free of soot has recently been invented. Hitherto the tubes have been swept out about every seven days; by means of the new device the retarders in the tubes which break up gases on their way through the tubes are rotated by a handle on the outside. The operation is so simple that it can be performed every few hours, giving an economical result in the coal consumption.

SHOP NOTES

A SPECIAL METHOD OF BRAZING CAST IRON.

The following process is given by a correspondent of the Blacksmith and Wheelwright as his particular method of brazing cast iron. The illustration shows a piece of windmill, all in a solid cast piece, with a break at A, and brazed from the inside in the manner described. The writer says:

"I take 1 part of pulverized glass, 2 parts of ground marble, ½ part of carbonate of



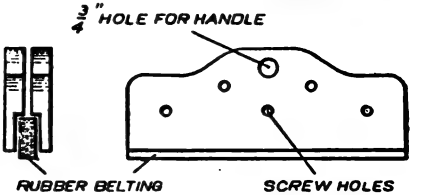
Brazing Cast Iron

iron, 2 parts of pulverized borax. For flux take 1 part of water and 1 part of pulverized borax. To grind your marble and iron take a bastard file or an emery wheel about No. 36 grit, so as not to make filings too fine. To pulverize the glass I take a piece and hammer on it on my anvil. One learns in a few hammerings the best way to pulverize it. There is a trick in it, but I don't know how to explain it.

"When your casting is ready to braze, take your mixture and the flux and make a paste and put a thin coat on each piece and bolt, strap or wire them together so they will not move while in the fire. Put it in clean fire and heat to high red heat; put your brass spelter on it till it melts; use plenty of it on your work to be sure of a good job. When the brass is melted, cut off your blast and let it rest there till it turns nearly black, then you can remove it and put it away so you can use your fire if you are rushed. When cold take off braces, bolts or wire, whichever it may be, file up and your job is ready. Now remember, if there is any dirt or grease you won't get rid of it. I heat the iron to a red heat and use steel brush and give it a good brushing. Then let it cool. Don't bolt the braces too tight together; if you do, when you heat your casting it will expand and your brass won't go through where it should. You must use borax the same as if you were going to weld steel. To braze iron or steel do not use glass or malleable iron; use only borax with some carbonate of iron, and of course you must use the brass. You must cake your coal so there will not be too much sulphur or gas in it to spoil your job."

MAKING A FLOOR-CLEANER.

The floor-cleaner shown in the sketch was made by a correspondent of the Engineer from some rubber belting about 3 in. wide and 18 in. long. Two pieces of hardwood 6 in. wide, 18 in. long and ½ in. thick were cut in the form shown, and put



Rubber Floor-Cleaner

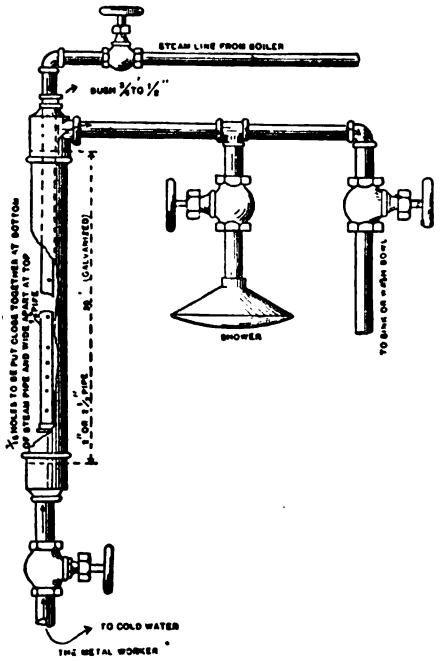
together with the rubber between them, so that the rubber projected below the wood about ¾ inch. An old broom handle was inserted and the cleaner was complete.

The floor on which this was used was a cement one, and the cleaner worked well for pushing water out of the room. It is also good as a mop for drying a floor after a scrub-down.

Aluminum, because it withstands the action of acids, is a suitable material for hooks for removing photographic negatives from acid baths. It makes good acid funnels, also.

WARMING WATER FOR SHOWER BATH OR WASH BASIN.

There are many establishments where steam is available in which a shower bath can be used with advantage by the employes of the plant, for their refreshment in the summer season, and for purely bathing purposes at the end of the day's work all



The Shower Bath

the year round. At a recent meeting of the Pacific Coast Gas Association the device shown in the accompanying illustration was presented in the "Wrinkle Department" for the consideration of men working in gas manufacturing establishments, and was met with strong approval.

It is made with a piece of 2-inch or 2½-inch pipe 2½ feet long. At the lower end it is reduced to ¾ inch. Where the cold water enters at the upper end there is a reducing T to ¾ inch. The side opening is where the hot water is taken off to the shower or basin. At the top of the T there is inserted a perforated tube of 1½-inch pipe with cap on the lower end. This tube is connected with the live steam line. The user can get the desired temperature of water by adjusting the valves on the cold water and steam inlets. This will be found very handy and a cheap shower for use at the works or any place where steam is to be had.

THINNING ZINC PAINTS.

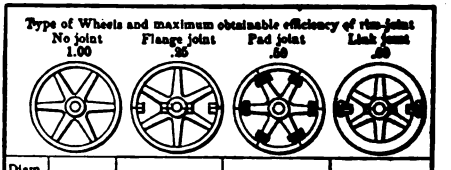
The proper medium for mixing zinc white is pale boiled oil. Many firms manufacture pale boiled oil especially for this purpose, and the painter will ordinarily save himself considerable trouble by procuring this proper medium at the outset.

In mixing zinc paints, use as much oil and as little turpentine as possible, the oil being pale boiled, and keep the paint as "round" as possible. All zinc paints can be applied much rounder than lead paints.

Oxide of zinc and sulphide zinc white, when ground in oil in the form of a stiff paste, should be kept from air in the stock casks, and whenever a portion is removed the surface should be smoothed down and covered with a little raw linseed oil. Never use water, but always oil, for covering the surface of zinc paints.

SAFE SPEEDS FOR GRAY-IRON FLY-WHEELS.

The following valuable table of safe speeds for gray-iron flywheels has been compiled by W. H. Boehm, superintendent of the flywheel department of the Fidelity and

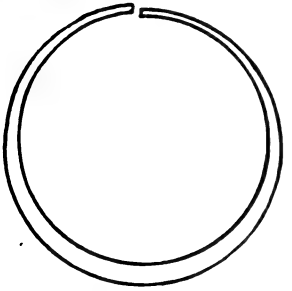


Diam. in Ft.	R.P.M.	R.P.M.	R.P.M.	R.P.M.
1.	1910	955	1350	1400
2.	955	478	675	700
3.	637	318	450	466
4.	478	239	338	350
5.	382	191	270	280
6.	318	159	225	233
7.	273	136	193	200
8.	239	119	169	175
9.	212	106	150	155
10.	191	96	135	140
11.	174	87	123	127
12.	159	80	113	117
13.	147	73	104	108
14.	136	68	96	100
15.	128	64	90	93
16.	120	60	85	88
17.	113	56	79	82
18.	106	53	75	78
19.	100	50	71	73
20.	95	48	68	70
21.	91	46	65	67
22.	87	44	62	64
23.	84	42	59	61
24.	80	40	56	58
25.	76	38	54	56
26.	74	37	52	54
27.	71	35	50	52
28.	68	34	48	50
29.	66	33	47	48
30.	64	32	45	46

Casualty Company. The American Machinist says: "The table is figured for a margin of safety on speed of approximately three, which is equivalent to a margin on stress developed, or factor of safety in the usual sense, of nine."

CARE OF PACKING RINGS.

Packing rings used by air brake repairmen should never be hung on nails or hooks, as they are soon sprung out of a true circle by their own suspended weight, necessitating much filing away of the ring to make



Effect of Hanging on Nails

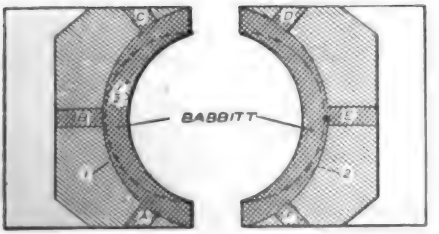
it fit the cylinder. This, says Locomotive Engineering, is especially true of governor, triple valve and equalizing piston rings.

For the small rings use tin boxes slightly larger than the rings, which should be laid flat in the box. Large air pump rings should be laid on shelves. If thus cared for, the circle will remain true and the rings may be readily fitted.

TO REPAIR CRANKPIN BRASSES.

The sketch shows a worn-out wristpin box from a high speed engine, the dotted lines showing where the pin had worn the metal away. A correspondent of the Engineer tells how he repaired it.

It was taken out, put in the lathe and bored out to the lines 1 and 2, and the six ½-in. radial holes (A, B, C, D, E, F) were drilled. A pin of dry wood ⅛ in. smaller in



Babbitting the Box

diameter than the wristpin was then turned and the boxes babbitted around it. The boxes were then put in the lathe and bored out to the size of the pin. The oil grooves were cut and the rod connected. The brasses have never given the least trouble since the repair and the babbitt does not require keying so often as the brass box did.

VISIBLE SIGNALS FOR TELEPHONES.

In a factory or plant where there is considerable noise at all times and where the room is so large it is not always possible to hear the telephone bell, an ingenious arrangement for visible signals may be used to advantage.

Red incandescent lamps of about 16 candlepower each will serve as good signals and several should be placed at various points where they will be likely to be noticed, if automatically turned on. Connect them all on the same pair of wires and run these to the telephone.

On the back of the closet or partition where the telephone is placed mount a block

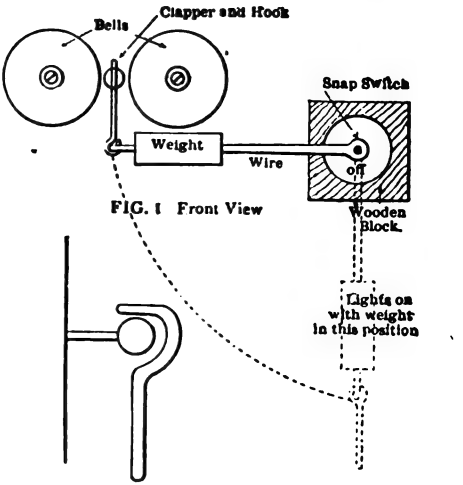


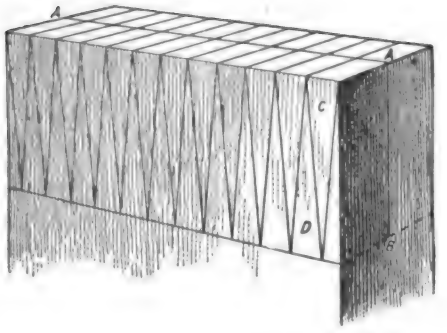
FIG. 2 Clapper and Hook

of wood thick enough to have its upper surface flush with the magneto case. On an ordinary snap switch without a handle attach a long bar having a weight at its outer end and small hook made of copper wire. Mount this on the block. Slip the hook over the clapper of the bell and balance it. Figs. 1 and 2 show this arrangement clearly. When the telephone bell rings, the hook will slip off, the weight fall and the switch will throw on the red lights, notifying any one in any part of the room who may see them that there is a call at the 'phone.

This ingenious apparatus was first used in a large steel mill where news of a fire in the town was noised abroad by the boiler house whistle upon notification over the 'phone, says a correspondent of the American Machinist.

A GOOD METHOD OF SAWING WEDGES.

For this purpose use a good, stiff back saw, sharp. First saw line A A down to B. Second, saw wedges C out and then raise them up one-eighth inch to make a guide for the sharp ends of the wedges D, all of



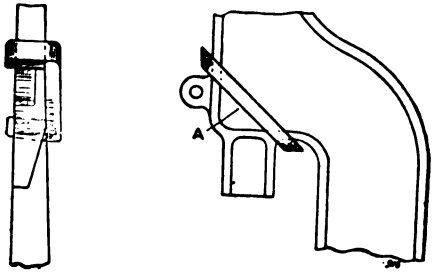
Sawing Wedges

which saw off at the line B after the C wedges are sawed off.

"We use pitchy floor scraps," says a correspondent of the Blacksmith and Wheelwright, "and after the first wedge cut, every cut makes two wedges, and they stick better than a shaved wedge."

BRACING A STEAM-HAMMER FRAME

A crack developed in one of the standards of a 10-cwt. steam hammer while some large motor pinions were being forged a short time ago. The Electrical Magazine, London, tells how the standard was braced



Bracing a Steam-Hammer Frame

so that though it has been used for heavy jobs several months it shows no sign of breaking more.

The crack is shown at A. A 2-in. square bar of steel was forged to the required shape, as shown in the sketch. Cooling contracted the bar and so braced the frame.

There were produced in the United States last year 280,000 tons of lead.

HOW TO FIX PEARL TO GLASS.

The design desired should be first carefully gilded in outline and the spaces between the lines filled with very clear varnish. Allow this to become tacky, and then with a little size on the end of the finger pick up some of the flakes of pearl, put them on different parts of the letter; fill in with smaller flakes and press some pearl powder on to cover the space completely.

Apply the varnish with a soft hair fitch, says the Master Painter and when the work is quite dry press a layer of tinfoil well into the breaks to fix the pearl to the back. Paint over with tinted white lead, mixed stiff in boiling oil with sufficient japan gold size to dry quickly.

A SIMPLE METHOD OF BURNING OUTLINE LETTERS ON GLASS.

Write the letters in with a weak solution of white matting acid. This will roughen the surface of the glass. Gild the letters with isinglass size, bringing the gold beyond the letters in order to obtain a bright margin line. Then write the whole of the letters, center and edges, with japan gold size and red lead. When dry remove surplus gold with water. Varnish, japan gold size or coachmaker's black japan makes a good protective backing.

CLEANING BOILER TUBES.

In discussing a previous article in the National Engineer Chas. B. Risley says:

There seems to be no objection to the use of a scraper as a cleaner of boiler tubes, except the laborious task necessary when it is used, as against the comparatively easy work of operating a steam blower. In my opinion neither of the above methods gives the best results. The great majority of scrapers are not efficient tube cleaners because they cause the soot in the tube to bulk up ahead of the scraper in a manner that necessitates the scraper passing over some of it and compressing to the sides of the tube, resulting in a poorly cleaned tube. The soot, so compressed, forms a surface upon which other soot finds easy and convenient lodgement.

With purely steam blowers, trouble arises from the fact that the moisture in the expanded steam, after leaving the cleaner, forms a scale on the tube that calls for the use of a scraper for its removal.

I believe that the hot blast flue cleaner will clean tubes more thoroughly than

either or both of the methods previously mentioned.

With the hot blast system we have, for example, for a 4-inch tube, a steam nozzle ¾ inch in diameter, which is used to syphon the gases from the furnace at approximately 800 to 1,000 degrees, the size of the gas inlet being 2¼ inches in diameter. In this way the volume of steam is superheated, thus preventing moisture or cold air entering the tube.

I have conducted a number of tests to determine the temperature and velocities of the discharge of steam tube cleaners, with results as shown in the following table:

TYPE OF CLEANER	Boiler pressure	Size of tube	Size of steam nozzle	Area of air inlet, sq. in.	Degrees of superheat	Temperature of discharge	Velocity in feet per second of discharge	Relative temperature to water in boiler
Hot Blast Blower	90 lbs.	2¼-in.	¼-in.	3.14	113	324 F.	720	3 deg. above
Standard Steam Blower	90 lbs.	2¼-in.	¼-in.	0	0	215 F.	275	116 deg. below
Steam Blower with Air Inlet	90 lbs.	2¼-in.	¼-in.	3.14	0	180 F.	700	151 deg. below

FORGING HOLLOW SHAFTS HAVING LARGE HOLE IN CENTER.

Hollow shafts of large diameter having a large hole in the center which tapers toward the ends (Fig. 1) should be forged in the manner shown in Fig. 2. Bore straight through the largest diameter and then put the ends under the hammer or forging machine and bring them down to the diameter

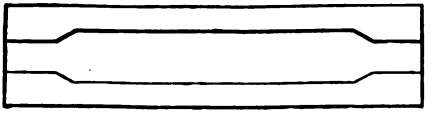


Fig. 1

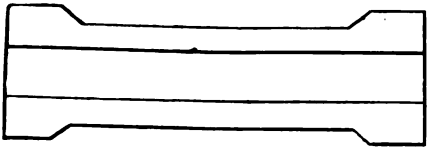


Fig. 2

of the rest of the shaft, says a correspondent of the American Machinist. This reduces the size of the hole at the ends and reinforces the shafts where the couplings are shrunk on.

Such shafts are used in our large men-of-war. In a 16-in. shaft the hole for a few feet at each end is about 6 in. in diameter widening into a hole 9 in. in diameter at the center.

HOW TO BURN OUTLINE LETTERS ON GLASS.

The following instructions apply where each letter is to be outlined with a burnished line ¼ inch wide, the interior of the letter being in a dull gold.

Lay the glass flat on the table, and for the parts of each letter which are to be in dull gold leave plain glass; plate coat the rest with embossing black. The exposed portions of the glass should then be eaten away with hydrofluoric acid, which will not attack the covered portions and will do its work in a few minutes to a half-hour, depending on the strength of the solution. To ascertain the depth to which the acid has eaten draw a needle or other fine steel instrument against the edge of the letter. When deep enough, pour off the acid and wash the surface of the glass with clean water. Remove the black with turpentine.

Gild the letters, allowing the gold leaf to come beyond the edge of the letters to the required width of the burnished line. Use a weak solution of isinglass as a medium. When dry protect the gold line by a coating of red lead and gold size. When this is hard the surplus gold may be readily washed off.

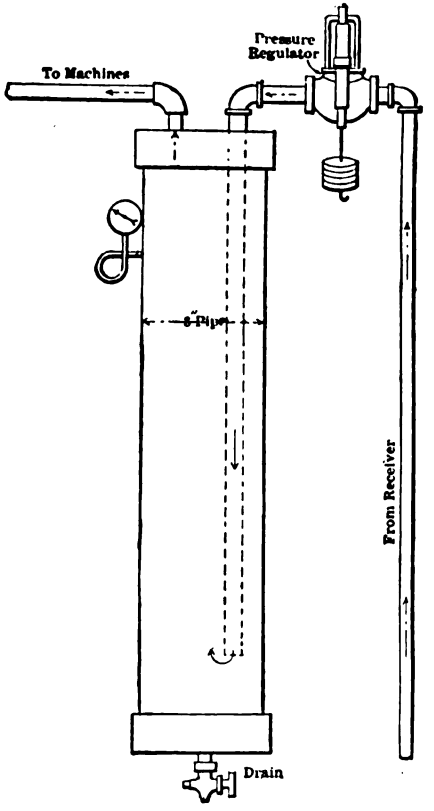
If the plate glass cannot be removed from the sash, the acid cannot be used in the manner described. In such case lay the gold around the edges of the letters on the back, on a weak soiution of isinglass. Cut the gold on a cushion and place on the wet size. When dry, the gold from the face side will appear bright. It may be further burnished, if desired, by rapidly pouring hot water on the letters and allowing it to run off, using great care to prevent the gold washing off, if a weak solution is used. Paint the line of gold in with a backing of gold size or varnish and red lead, and when it hardens wash off the gold beyond the edge of the line. To make the letters appear dull done to the edge with isinglass, write the inner part in with pale varnish and when almost dry, gild.

Our readers are urged to contribute to "Shop Notes" any kinks which they have worked out, or may be using to advantage and which others might use with benefit.

MEANS OF REMOVING MOISTURE FROM COMPRESSED AIR.

Compressed air would be even more extensively used than it now is were it not for the presence of moisture which, in some instances, would do damage to the work in hand.

In a large plant where compressed air is used a great deal, the moisture was successfully disposed of after several means had been tried and failed, says Power.



Removing Moisture from Compressed Air

The receiver pressure being 80 pounds and only 25 pounds being necessary, a reducing valve or pressure regulator was installed, as shown in the sketch, which has made dry air a possibility.

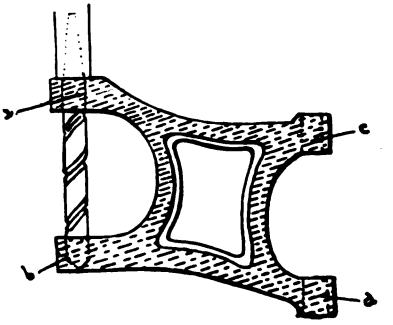
The drain shown at the bottom of the tank may be opened and a piece of paper held under it, and no moisture will be visible, except perhaps a little oil, if it has not been opened for quite a while.

Since this apparatus has been put in, there has not been any more trouble with moisture, and if it helped in this case it will surely help others.

LENGTHENING A TWIST DRILL WITH PAPER.

Some time ago I had a casting, as shown in sketch, to be drilled at a, b, c, and d, 1-inch hole. The holes had to be drilled absolutely in line through both lugs, for a 1-inch shaft to go through.

I clamped the casting to the angle plate, and after I had drilled through the lug, a, I found that the drill was not long enough by ½ inch to drill through lug b. Of course, I could have turned the casting around and drilled from the other lug, but this would have necessitated a very careful lining up to get them absolutely in line. Instead of



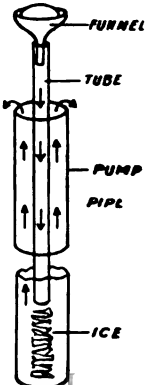
Distance Reached With a New 1-inch Drill.

reversing the casting, I took the drill out and wrapped paper around the taper socket on the drill, then by placing same in spindle of drill and tapping it gently, I succeeded in drilling through both lugs at one setting, and the drill never slipped in spindle.

I know of no rig that can be fixed up any quicker than this one, providing there is nothing at hand except the average length of drills.—Norman, Muscatine, Iowa.

THAWING A PITCHER PUMP.

To thaw a pitcher or common kitchen pump, unscrew the pump and put a hollow elder or small iron pipe down the main pump pipe. With a funnel at the top of the tube or small iron pipe boiling hot water can be made to reach the frozen part. Keep pouring the hot water. Two feet can be thawed in two minutes. Before retiring draw a pail of water so there will be a supply on hand.—Contributed by Carl Baum, Valparaiso, Ind.



HANDY TABLE FOR SPACING HOLES IN CIRCLES.

The following table for spacing holes in circles, sent us by J. C. Bush of Duluth, Minn., is a great time saver and avoids making numberless trials.

Suppose the problem was to divide a 62-inch circle into 44 equal parts. First find 44 in the table and on the same line under S is .071339. Multiply this by 62 which gives 4.423018 in. Having drawn two diameters at right angles to each other the dividers are set to 4.42, using a scale of one-tenth. Convenient for draftsmen and patternmakers.

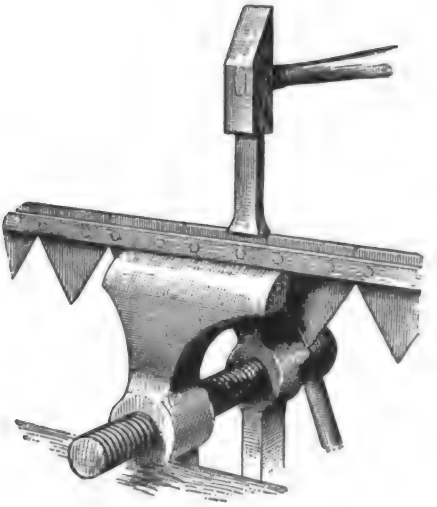
No.	Degrees.	Seconds.	Sine.
3	60	..	.8660
4	45	..	.7071
5	36	..	.5880
6	30	..	.5000
7	25	43	.4339
8	22	30	.3826
9	20	..	.3420
10	18	..	.3090
11	16	22	.2817
12	15	..	.2588
13	13	51	.2393
14	12	52	.2227
15	10	..	.2079
16	11	15	.1951
17	10	35	.1837
18	10	..	.1736
19	9	29	.1648
20	9	..	.1564
21	8	35	.1492
22	8	11	.1423
23	7	50	.1363
24	7	30	.1305
25	7	12	.1253
26	6	55	.1204
27	6	40	.1161
28	6	26	.1120
29	6	13	.1081
30	6	..	.1045
31	5	50	.1012
32	5	38	.0980
33	5	27	.0950
34	5	19	.0923
35	5	05	.0896
36	5	..	.0871
37	4	52	.0848
38	4	44	.0826
39	4	36	.0805
40	4	30	.0785
41	4	23	.0765
42	4	17	.0747
43	4	11+	.0730
44	4	5+	.0713
45	4	..	.0697
46	3	54	.0682
47	3	49	.0668
48	3	45	.0654
49	3	41	.0641
50	3	36	.0628

This table can be extended to any number by consulting Trautwin, page 1022.

To test the purity of turpentine drop a small quantity on a piece of white paper and expose to the air. No trace will be left if the turpentine is pure, but if it contains oil or other foreign matter the paper will be greasy.

EASY METHOD OF REMOVING KNIVES FROM SICKLE BARS.

This is a difficult task unless the smith knows just how to go about it, and comparatively simple when he does. Many a smith has tried to remove worn out or broken knives from mowing machine sickle bars by means of a chisel and punch, with the result that the rib on the back was either bent



Taking Knives from a Sickle Bar

double or broken in two, says a correspondent of the Blacksmith and Wheelwright.

To make an easy job of it, catch the knife to be removed firmly in a vise, having the rib on top of the vise but not caught in it. Then with a set hammer placed so it will just catch the knife and not the rib, drive downward, and the rivet will be cut off, as if by magic, between the knife and the rib. Cut but one rib at first, and then cut the other one, and the blade will then drop off. In this way ten blades can be knocked out in as many minutes without trying the patience too greatly.

TAKING SPUDS OUT OF BOILERS.

Plumbers often find it difficult to take spuds or nipples out of old boilers as in hammering spuds to loosen them one is apt to disfigure or split them. To take them out without injuring them heat nipple or spud with torch or furnace and when hot put on pipe wrench and unscrew. If it does not come heat a little more. This method saves time, trouble and noise.—Contributed by Arthur Ed. Hauslein, Chicago, Ill.

CLEANING FLOORS.

One pound of common soda and one pound of quicklime melted or mixed in one gallon of boiling water, is good for removing hard paint and restoring color of floors, says the Master Painter. Saturate the floor with the solution, sprinkle clean, sharp sand over it and scrub with soap and water. This will clean and bleach the floor perfectly and it may then be waxed.

WIPING JOINTS IN HARD PLACES.

Where a building is equipped with a wrought-iron pipe screw joint drainage system and where a joint must be wiped

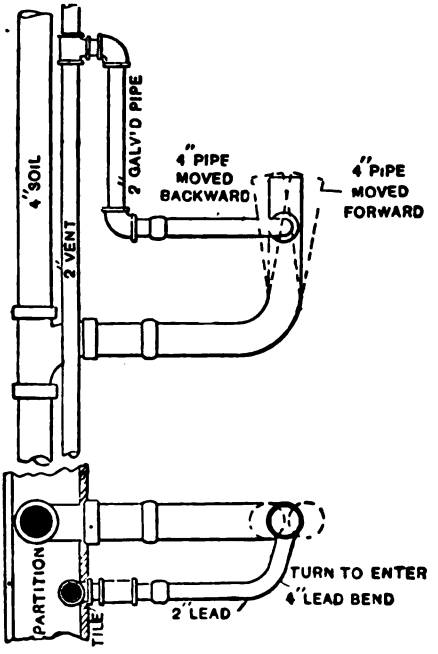


Fig. 1.—Where Joints Must Be Wiped

under the closet to connect the vent to the lead bend connecting the closet with the waste pipe, considerable trouble would be saved, says the Metal Worker, if the 2-inch vent pipe were connected with the lead bend before the cementing and tiling was set and if a 45 or 90 degree bend was made in the 2-inch pipe, so as to allow for any inaccuracy of the piping or fixtures when finally set. This would allow the pipe to be still further bent or straightened to meet the requirements. Some idea of the conditions met with under the floor where the joint must be wiped are presented in the plan and elevation given in Fig. 1. The dotted lines show the extent to which the lead bend may be moved in order to facilitate the wiping of a joint when the vent connection is made with the lead bend.

It is often difficult to hold the heat until the joint is properly made, where the pipe is as thin as the lead bend or the vent pipe. Fig. 2 shows an arrangement for maintaining the heat until the work is finished. An old piece of tin plate or sheet iron is bent in the form of a small basket with ends extending up to turn down over the end of the lead pipe and so support the basket at the point desired. Sufficient air spaces to allow free radiation of the heat and continued combustion of the hot coals which should be placed in the basket should be made. Perforations in the sheet metal will suffice. Stuff the top end of the bend with paper to prevent the generation of too much heat. This method is convenient where a

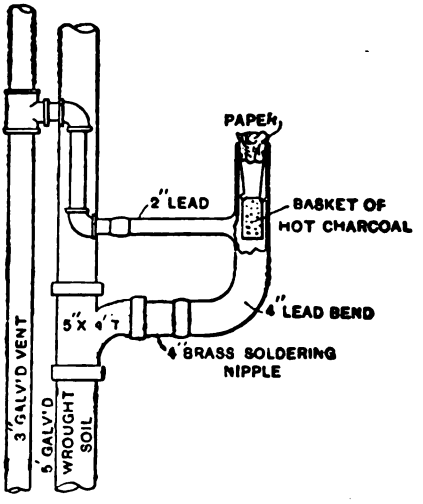


Fig. 2.—Getting Up a Heat

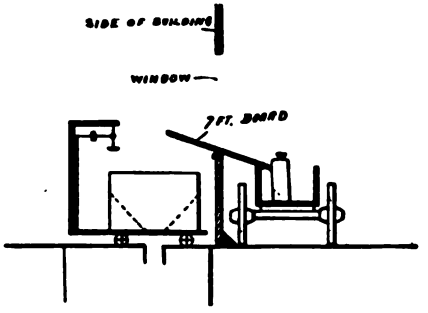
pipe must both be dried out and heated before proceeding with the work.

A SIMPLE FIRE EXTINGUISHER.

Where gasoline is used in any great quantity there is always danger of fire. In the ceiling over the tank containing the gasoline hang a fragile bottle containing about a gallon of ammonia, by a string or fusible link. Should the gasoline take fire the bottle will fall and be broken, releasing the ammonia and putting out the burning gasoline.

WHEAT DUMP FOR CUSTOM MILL.

The sketch represents a method of receiving wheat at small custom mills. The farmer places the sack on the board and lifts



Dumping Board

it up until it tips, says the American Miller. Then the sack slides in and empties in a hopper scale. The advantage of this is that every sack of grain can be inspected, to say nothing of the saving of labor.

SOLDERING CAST IRON.

Soldering cast iron is a rather unsatisfactory undertaking at best. The ordinary killed acid is the best flux to use, says the Automobile. The surfaces to be united should be made bright and clean; this is most important. They should then be tinned separately and sweated together. The pieces must be kept hot, as any tendency to chill the solder will cause failure, and the parts should be pressed together as closely as possible while cooling. It will be seen at once, on commencing the tinning process, that solder has not the same tendency to adhere to cast iron as to brass, for instance. For this reason a soldered joint in cast iron can never be depended upon to stand much strain. Some of the better and closer cast irons can hardly be soldered at all. Gasoline motor cylinders are usually exceedingly difficult to solder.

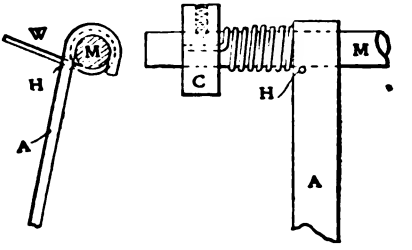
PREPARING TRACING PAPER

The following is a capital method of preparing tracing paper for architectural or engineering tracings, says the National Builder: Take common tissue or cap paper, any size sheet, lay each sheet on a flat surface and sponge over (one side) with the following, taking care not to miss any part of the surface: Canadian balsam, two pints; spirits of turpentine, three pints, to which add a few drops of old nut oil; a sponge is the best instrument for applying the mixture, which should be used warm. As each sheet is prepared it should be hung up to dry over two cords stretched tightly and parallel, about eight inches apart, to prevent the lower edges of the paper from coming in contact. As soon as dry, the sheets should be carefully rolled on straight and smooth rollers covered with paper, about two inches in diameter. The sheets will be dry when no stickiness can be felt. A little practice will enable any one to make good tracing paper in this way at a moderate rate. The composition gives the substance to the tissue paper.

ANOTHER DEVICE FOR WINDING SPRINGS.

Either close or open wound springs of any pitch may be wound by the device shown in the sketch, says a correspondent of the American Machinist.

Make the piece A of a suitable piece of flat stock, long enough to rest against the front of the lathe bed, and bend to fit over the mandrel, M. The mandrel should be smaller than the finished spring by the amount of spring in the material being wound. Drill the hole, H, a trifle larger



Winding Springs

than the wire used, and chamfer its edges a little. Its position determines the pitch of the spring; the pitch being steeper the farther the hole is from the left. This bends the wire just at the point where it goes on the mandrel. Do not hold back on the wire, as there is practically no waste. The collar, C, mounted on the mandrel, has a hole drilled longitudinally in it, for receiving the end of the wire.

To wind a spring, grip the mandrel in the lathe chuck, pass the wire through the hole, H; bend the end of the wire over at right angles and insert in the hole in the collar, C. Start up the lathe and wind the spring. Use a fairly stiff mandrel and no support for the outer end will be necessary. For slender mandrels an old chuck mounted in the tail spindle may be used, having the jaws tightened enough to support the end of the mandrel.

RAISING THE STACK.

The raising of a tall stack always becomes a matter of popular interest before it is accomplished and any bungling may bring embarrassment to the man superintending the job, who, in all likelihood, had not counted on the group of interested spectators. A correspondent of the Woodworker tell how he goes about this operation.

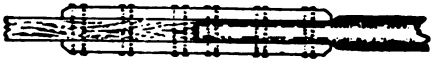


Fig. 1

Derrick pole, blocks, tackle and all necessary rigging were collected soon after the construction of the building had been started, as it is good policy to have them at hand and in readiness. The derrick or "gin" pole usually consists of three poles set in a tripod. In this case a poplar log "snaked" up the bank was the best available. The pole was 54 ft. long and 10 in. in diameter at the top end; the brick stack stump was 18 ft. high and the iron stack built and the pole set on it, which gave about 9 ft. of space between blocks when the stack was "high," ready to set over into place.

Blocks and tackle consisted of a double or two-sheave block having a becket to which was fastened one end of the 1¼ in. rope (500 ft. long) and a triple or three-sheave block. The other end of the rope was the "fall" of the line—or the rope to which power is applied. It was passed four times around the "crab" of the drum, which "crab" was a geared windlass consisting of a crankshaft, having a crank on each end and carrying a small pinion which geared into a spur gear, keyed onto one end of a spool shaft. The spool was tapered down from the flanges toward the middle so that the rope slipped toward the center as wound on, and one man pulling on the slack end would cause it to impinge on the spool enough to raise the load pulled by two men at the cranks. This crab was geared so that the pinion made six turns to the spur gear's one and by means of it, with the tackle blocks, two men could raise a load

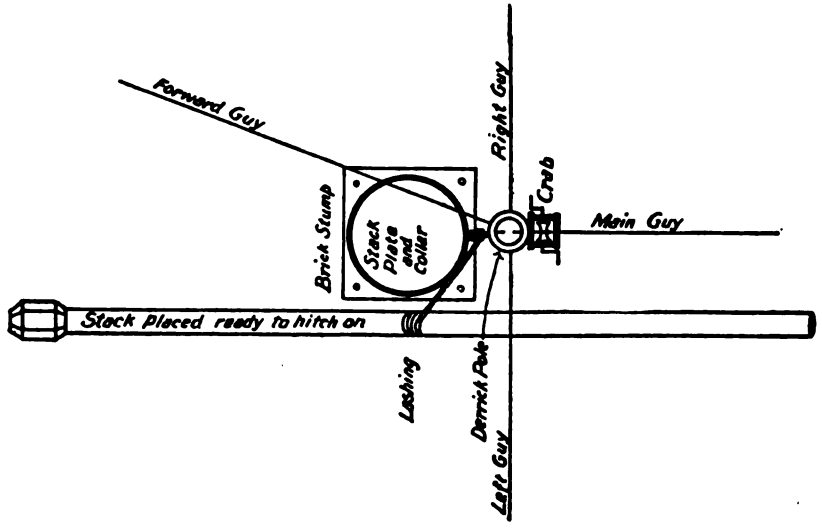


Fig. 2

with the spark arrester, was 87 ft. long, consequently the pole was not long enough.

To meet this emergency a butt splice was made at the large end of the pole by means of a 12x12-in. by 16 ft. timber and two pieces 6x12 in. by 12 ft. (Fig. 1.) This gave 70 ft. of pole, hardly length enough, allowing 10 ft. for blocks, sling and lashing for landing the pole in the stump. To gain length a crib of railroad ties, 5 ft. high, and having a platform of 2-in. planks, was of 8,000 lbs.—more than 5 men could pull up bodily by hand.

The derrick pole to be raised weighed 4,000 lbs. A 3x4-in. by 24-ft. scantling and a pair of double ¾-in. blocks were first raised by hand. With this a larger derrick pole 5x5 in. by 40 ft. long was pulled up and securely stayed with four guy ropes. Then by means of blocks, tackle and crab the main derrick pole was hoisted and guyed as shown in Fig. 2. Before performing

this last operation the guys to the main pole were all pulled very tight by means of a pair of small blocks, each guy in turn until the slack was taken out of them. This was done by placing a "stop knot" on the guyrope, fastening one block to it and another to a sling around the post to which the guy is fastened. The "stop knot" is tied as follows:

We will say the guy is a 1¼-inch rope and the stop knot rope ⅝-inch. Take hold

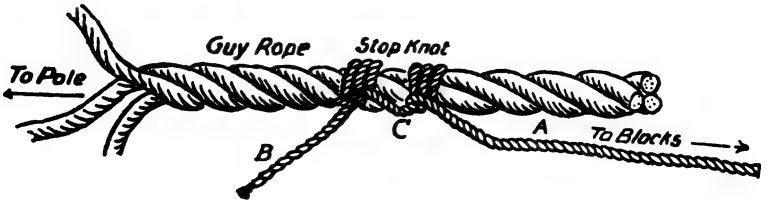


Fig. 3

of the end of the smaller rope marked A (Fig. 3), with the left hand; hold it against the large rope and make three round turns toward the right over the large rope.. Bring the end of smaller rope, marked B, back, and take three half hitches to the left. Bring the end marked A through the loop at C, and attach to the hook of block that has the larger number of sheave pulleys. It is very important that the guy ropes should be pulled tight, so that the stack does not take a lurch and gain momentum enough to break one or more of them.

In the instance mentioned, the tackle blocks and rope were not raised with the pole. Before the pole was raised "cleat" steps about 2 ft. apart were put on and a 1¼-in. hole was bored in the top of the pole and a 1-in. round iron davit put in, the hook part hanging over toward the stump when the pole was up. A man went up carrying a small line with which he pulled up a pair of small blocks and with this tackle the large blocks and tackle were pulled up.

The appliances all being in place, the crab bolted to the foot of the pole, all the guys pulled tight, and the 'makefasts" all secure, the lashing was put around the stack 3 or 4 feet above the center of the weight of the stack—that is, so that the bottom end of the stack was a little heavier than the top. This lashing is usually a rope of the size of the block line, passed six times around the stack, and the hook of the lower block hooked into three of the turns, the other three pulling tight around the stack, to grip and not slip up. As all the weight of the stack comes onto this lashing near the center, if the joints are not very strongly riveted the weight of the ends will sometimes shear the rivets off at the joint nearest the lashing. To avoid this three ribs of angle iron, ¼x2x2 in. about 20 ft. long were put in, placed equidistant on the inside circle of the stack, lengthwise, and securely riveted to it. Some boiler builders furnish these angle bars to be put in full length of the stack, but unless the stack is of very light weight material it is not necessary except at the middle.

A set of four guy ropes were then fastened to the stack 11 ft. from the top and another set of four 13 ft. lower down. Everything was made secure and taut and then, the stack laying alongside (Fig. 2) the blocks were hooked into the lashing, the winding of the rope on the crab was begun and the stack slowly went up. The lower end was held down by a hand line and thus an upright position was gradually assumed. When at the right point, it was pulled over into place, settled down on the stack plate, plumbed and the guys secured to the eight posts previously set.

POINTERS ON ARMATURE COILS.

Wires should be of the proper size to obtain the requisite electromotive force, but as short and thick as may be, in order to give the least resistance possible. Their electro-conductivity should be of the best, good copper wires being nearly equal to silver. Coils should be wound with air spaces, as some heat is always generated by their resistance, and ventilation cools them. Mica and asbestos are good for insulating armatures.

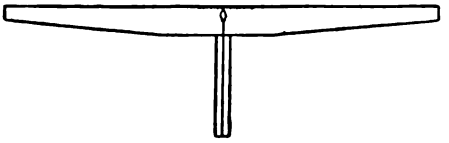
The wind pressure upon a flat surface is twice that upon a cylindrical surface of the same height and width.

Eleven pounds of nails will nail on the 1,000 laths required to cover 70 sq. yds. of surface.

HOW TO MAKE A LEVELING BOARD.

The board shown in the sketch is handy for grading pipe trenches or leveling ground.

It may be made from an ordinary piece of lumber 6 ft. long, 8 in. wide and 1 in. or more thick. At the center and at right

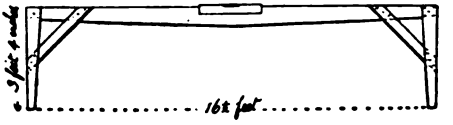


Home-Made Level

angles with the bottom edge of the first board rigidly attach a piece of the same lumber, about 3 ft. long. At the top of this upright piece attach a plumb bob. Mark a scale on the bottom of the board and at the center. The swing of the bob will indicate the grade.

LEVEL FOR GRADING DITCHES.

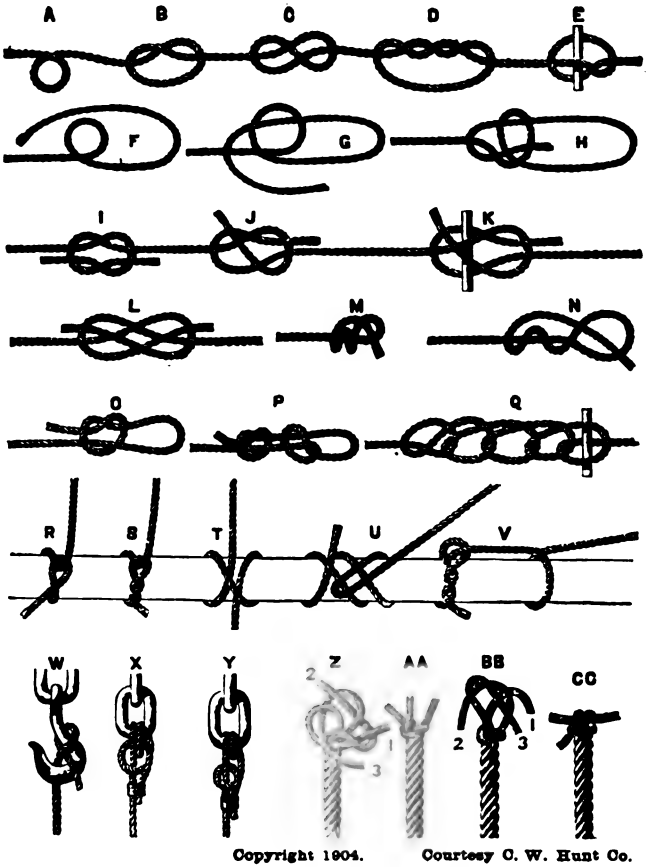
A level like the one shown in the illustration is used in Montana for grading irrigation ditches. The construction of the level is plainly shown. In operation the level is carried by one man and an assistant makes



Home-Made Level

marks with a shovel, to guide the driver of the ditcher, which follows about 200 feet in the rear. The usual grades allowed are from one-half to three-fourths of an inch to the rod. The level being just a rod in length is especially handy for the purpose mentioned.

Knots You Ought to Know



A.—Bight of a rope.
B.—Simple or Overhand Knot.
C.—Figure 8 Knot.
D.—Double Knot.
E.—Boat Knot.
F.—Bowline, first step.
G.—Bowline, second step.
H.—Bowline, completed.
I.—Square or Reef Knot.
J.—Sheet Bend or Weaver's Knot.
K.—Sheet Bend, with a toggle.
L.—Carrick Bend.
M.—Stevedore Knot completed.
N.—Stevedore Knot commenced.
O.—Slip Knot.
P.—Flemish Loop.
Q.—Chain Knot, with toggle.
R.—Half-hitch.
S.—Timber-hitch.
T.—Clove-hitch.
U.—Rolling-hitch.
V.—Timber-hitch and Half-hitch.
W.—Blackwall-hitch.
X.—Fisherman's Bend.
Y.—Round Turn and Half-hitch.
Z.—Wall Knot commenced.
AA.—Wall Knot completed.
BB.—Wall Knot Crown commenced.
CC.—Wall Knot Crown completed.

PUTTING RUBBER TIRES ON IRON BAND SAW WHEELS.

The following kink will be of use to those who experience some difficulty in making the tires stick. The reason they do not stick is because the wheel is cold and chills the shellac.

Fill a common oil can, having a small outlet, with gasoline. Have the wheel clean and keep it revolving slowly by hand. Put a little gasoline on all around the rim of the wheel and then touch a match to it and keep the fire all around the rim by putting in gasoline wherever the fire dies out. Keep this up until the wheel is very warm, then let the fire die out and put on very thick shellac and then the tire. The tire will stretch even all around and cause no more trouble by coming off.—Contributed by Chester R. Wyman, So. Paris, Maine.

HINTS FOR DRAFTSMEN.

Steel pens are soon ruined through not wiping, and even when faithfully cleaned after using, soon accumulate more or less deposit. They may be made as good as new in a few moments by rubbing with a bit of sandpaper until free from dried ink and rust. The sandpaper can be cemented on a tiny stick and take its place among the desk accessories, ready for instant use. Pens are cheap, of course, yet a good one one dislikes to part with, and the operation is so simple that it is worth while.

A fine or coarse pen can be created at will by means of an oil stone; a little practice will soon demonstrate the idea, rubbing at the sides reducing the lines, and across the end rendering the pen coarser. If any scratching ensues, a few trials will show where to apply the oil stone to remove the difficulty.

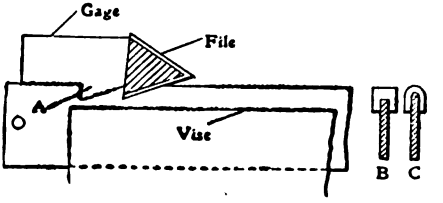
This method can be used to advantage also with etching pens. It sometimes occurs that the inking pens of a drawing set fail to ink properly and cut the paper. This is not only annoying but ruins the work. The oil stone, applied to each point after separating as widely as possible, will remedy the defect. Rub the finger over the points, to ascertain that there are no feather edges, and then continue with the oil stone until desired results are obtained. Afterward keep the tool clean. A little alcohol will be found good for this purpose.

When the glass in a slide rule is broken, the following will be found a good way to effect temporary repairs, until a new glass can be procured: Remove the broken glass, and cut a piece of cardboard to fit in its place; cut an opening to show the figures and lines, and string a hair across the opening, cutting a niche in the cardboard with a penknife for the hair, and being careful that it lines up properly. In this way one can use a slide rule until a new glass is obtainable.—Contributed by A. B. Weeks, Cleveland.

HOW TO MAKE A FINE-TOOTHED SAW.

Once in a while a saw having very fine teeth, fine as those on a jeweler's saw, but with a much wider blade is required. Such a saw can be made of an old spring from an eight-day clock, says a correspondent of The American Machinist.

The sketch shows the gauge made of ¼x½-in. machinery steel. Grind one side of a 3-cornered file safe, cut a piece of steel the length of blade you require and clamp in the vise; file one space A the proper depth, take the gauge in the left hand and apply in space A and file the next space,



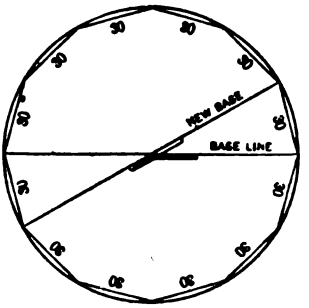
Making a Fine-Toothed Saw

holding the safe side against the gauge. Repeat this operation until the saw is complete. Regulate the depth by the number of strokes of the file. For thin brass or German silver tubing, one long stroke is enough; for flat stock, two; for hard rubber or fiber, three.

Punch holes in the ends to stretch in a frame, or for miter work make a back for the blade by slotting a piece of flat brass like B, or take a piece of soft brass and double over like C. If for any reason you should desire to draw the temper at each end, wrap the toothed part in a wet cloth, or, better still, stick through a raw potato and leave the end exposed and apply the heat. The temper is hard enough for gray iron and machinery steel. The blade can be made at the rate of 1 in. in 3½ minutes. No set is required. This saw makes a cut of .02 in.

DIVIDING CIRCLES BY THE STEEL SQUARE.

A circle may be divided into any number of equal parts by the use of the steel square, says the Metal Worker. To do this, divide 360 by the number of equal parts desired. This will give the angle of the parts in degrees.



Using Steel Square for Dividing Circles

Let us suppose that we wish to describe an octagon within a circle. Dividing 360 by 8 gives us 45 degrees as the angle of the parts. Set bevel square at this angle by aid of the protractor and from any diameter as the base line, secure a new base, using this from which to secure a second and so on until the circumference is completed. This proceeding is indicated in the diagram.

For a very large circumference, first make a small drawing, having a diameter which is a factor of the given circumference, keep in mind that dimensions of similar figures are in proportion and the sides may be secured by the rule of three.

BOILED OIL FOR ZINC PAINTING.

Mix 1 part of binoxide of manganese, in coarse powder, but not dusty, with 10 parts nut or linseed oil. Keep generally heated and stir frequently for 30 hours. The oil will then begin to turn a reddish brown and will answer for any paint.

FILLER FOR WALNUT.

To make a good walnut filler mix together equal parts of rye flour and china clay and a little burnt umber with two parts turpentine, one part boiled oil and two parts japan gold size. Apply with a rag.

If you have a good "kink" for this department, send it in. We can use rough sketches of any size.

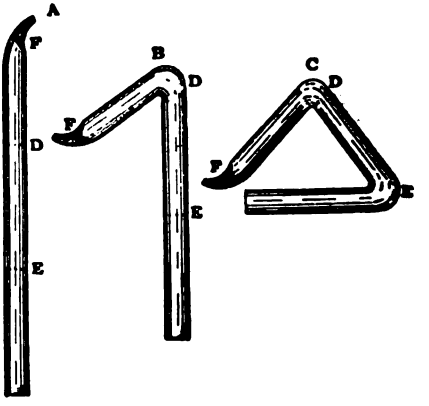
BLACK ENAMEL FOR WOOD.

Prime the wood with linseed oil, turpentine and while lead; give it two or three coats of black mixed with copal varnish and turpentine; rub it down dry with pumice stone and water, and then varnish with copal. Rub down again and polish with oil and rottenstone, which will give a perfect smoothness, says the Master Painter.

HOW TO MAKE A TRIANGLE.

A triangle which may be used by a lodge or other organization as a call instead of a bell or horn, is described in the American Blacksmith.

The triangle, which should be about 24 in. on each side, is made from a round bar of spring steel, ⅜ to ½ in. in diameter, and about 6 ft. long. Mark it off into three sections, as at A in the drawing, making the marks very light with a center punch, not a cold chisel. Heat one end of the bar and forge it as at F, then heat the bar at the mark D and bend the top over as at B. Now heat at the second mark E and bend the lower part toward the forged end F, but not touching it. True your triangle until the base is horizontal and the other two sides form equal angles at each end of the base. To see if the piece is straight, place it on a perfectly level surface, and if all sides touch equally your job is finished.



Making a Triangle

In working your steel bar be careful not to overheat and burn it, and also not to work too cold. Be sure to have an opening at one corner of the triangle, as shown in the sketch at C.

MOVING HEAVY WEIGHTS IN THE MOUNTAINS.

When nothing else is available the windlass shown in the accompanying sketches is used in the mountains of Montana for moving heavy weights. If it is possible to obtain anything else for the purpose this windlass is not desirable, but it may prove very useful in an emergency.

At the top and base of the windlass are iron bands having rings from which pass strong guy ropes and chains to iron rods driven into the ground. The weight is attached by means of strong rope, which unwinds from the small drum and winds upon the larger, thus giving double or triple purchase according to the difference in size of the two drums (Fig. 1). When the weight has been pulled up as far as the windlass can pull it, the rope No. 2B (Fig. 2) is shortened and the windlass rope lengthened or unwound and a new start is taken, or the windlass is moved farther back. A, Fig. 2, indicates the guy stakes.—Contributed by Lee R. Clarke, Bozeman, Mont.

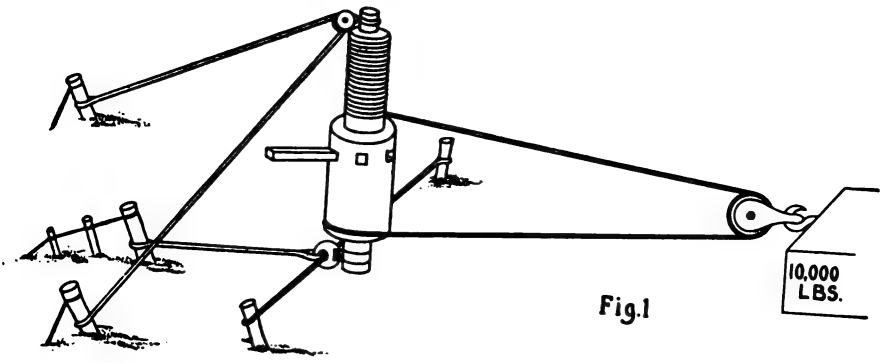


Fig.1

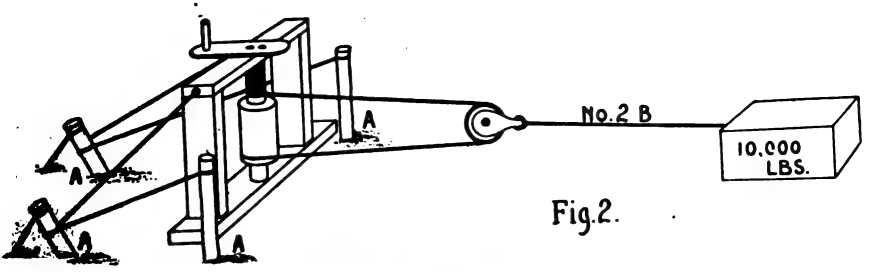


Fig.2.

For laying 100 cu. ft. of wall, a cord of stone, 3 bu. of lime and a cubic yard of sand should be allowed.

CEMENT FOR UNITING BRASS AND GLASS.

One part caustic soda, 3 parts rosin, 3 parts plaster, 5 parts water, boiled together. Hardens in one-half hour. To prevent hardening so rapidly substitute zinc white, white lead, or slaked lime for the plaster.

AUTOMATIC TIRE PUMP FOR AUTOS.

Automobile tires may be inflated while the machine is running. The device is specially recommended for use where a slight puncture is had and it is desirable not to repair before reaching home or some shop. The pump is carried in the tool box and fastens to the hub. An eccentric works the pump, the air steadily discharging into the tire. The pump will fit any make of wheel.

TO REMOVE FROST FROM WINDOWS.

One of the simplest and quickest methods of removing ice from windows is to place common coarse salt on a dry cloth and rub the frost. You will be surprised to see how rapidly the frost is removed, and the glass will not coat again for a day or two, even in very cold weather.

WHERE THE BEST BRISTLES ARE OBTAINED—RUSSIA THE SOURCE OF LARGEST SUPPLY.

Bristles are so extensively used for brushes of so many descriptions and for such widely varied purposes that one wonders where all the abundant supply comes from. Good bristles, however, are expensive and more than that, the American supply is of the lowest grade, short, crooked and fit only for the cheapest kinds of brushes.

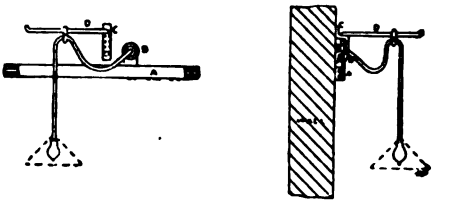
The reason for this is that in America hogs are grown for pork, and are killed young, the bristles being obtained at several of the large American packing plants, where men, hired for the purpose, grab what bristles they can as the hogs pass along in being cleaned, after killing. The bristles are gray and less sightly than the white ones obtained elsewhere. The hair from the ridge of the hog's back is the best and is saved for brushmakers' use; that from the sides is used in cheap grades of curled hair used by upholsterers, says the Master Painter.

Russia supplies the world with the highest grade of bristles, long, stiff and snow white, the latter quality being no inconsiderable factor, though for efficiency it makes them no better than the gray or black bristles. The reason Russia leads in this product is that the hogs from which the bristles are obtained live in the forest, half wild, and are not killed young for pork as in the United States. The better the hog for pork the poorer for bristles. Siberia also produces good bristles. The bristles are packed in casks weighing 250 and 300 pounds. They are assorted into the following grades: "Okataka," from 5 to 7 in. long and used by shoemakers, the coarsest and stiffest bristles grown. "Firsts," 4 to 6 in. long, stiff and elastic; "Suchoys," 4½ to 5 in. long, fine and soft; and "Seconds," 3½ to 6 in. long, also fine and soft. Each grade is furnished in the four colors, white, bronze, gray and black. The peasant women save the bristles and sell them to itinerant peddlars who in turn sell them to dealers. The best stock is gathered in the winter time and they range in price from 60 cents to $5.00 per pound. To be a good bristle buyer requires years of experience. The quality of bristles is determined by length, stiffness and color; cheap qualities are often made to appear far better than they really are.

Germany, France, China and India all furnish bristles in commercial quantities.

ADJUSTABLE LIGHT FOR FITTING BENCHES.

When fitting benches run along the wall they can be lighted up very nicely in the manner shown in the sketch. Lamps suspended from the roof are unhandy, as it is often difficult to fix them in just the right position.



Adjustable Light for the Fitting Bench

To arrange the light as shown run the wiring along the wall about 4 ft. above the benches, as at A, and take them up to the rose, B. A wrought-iron bracket, C, is fixed to the wall by two screws. This bracket is drilled to receive the swing arm, D, which is made out of a ½-in. round arm in the shape shown. A small S hook is hung loose on the arm and the wire passed over it. The loop in the lower part of the S hook, says the Electrical Magazine, London, should be just large enough for the wires to pass through and keep it the required height as adjusted.

HOW TO BRAZE HOLLOW CASTINGS.

Take old wagon or buggy boxing and crack it. Drive a very thin wedge in the crack to keep it from closing tight when hot. Take the softest brass filings or spelter that can be got. Mix it with about one-eighth of its bulk of boric acid. Put the box in the fire and heat red. Dip a point of a lily in the mixture and spread it along the crack; blow up until the brass is melted. Take out and lay it away to cool. Be careful not to jar while hot. Take a sledge and mash up when cold and you will see that you have brazed the easiest thing possible, and for this reason the brass was clean and the work contracted and did not move while heating and cooling, as separate pieces would, which is the secret of the whole job, says a correspondent of the Blacksmith and Wheelwright. If your break is dirty or rusty, file, scrape, saw and brush with muriatic acid. Or if you use common soldering acid in the shop, that is best.

SHOP NOTES

HOW TO STRAIGHTEN SHAFTING.

If it is not convenient to remove the shaft to be straightened, it may be straightened while in place by the method shown in Fig. 1. Have enough weight on the end of the

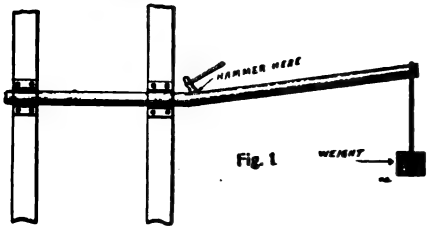


Fig. 1

shaft to cause considerable strain, and pound lightly on the top of the shaft.

In Fig. 2 is shown another method. Hang the shaft to be straightened by the ends, the bow being up, and pound on the under side with a light hammer. The light taps swedge the iron, says the American Miller,

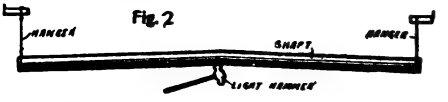


Fig. 2

and cause it to be straightened. Use a straight edge to true the shaft by.

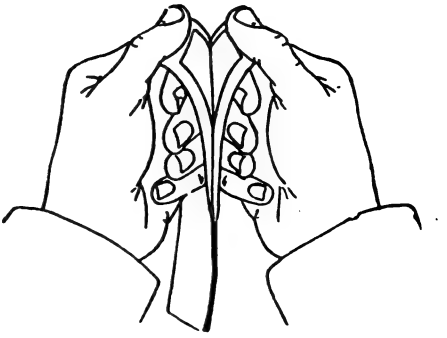
LAYING A DRAIN ACROSS A MARSH.

In drain laying, when a soft place is reached in a marsh or in seepy land, if stone or gravel cannot be procured the place should be treated as shown in the sketch, says Brick. The place when dried out is liable to sink, but by bridging it as shown, by driving down short 6-in. boards about 2 feet apart until solid ground is reached, truing up the tops of these boards and nailing on a 6-in. board to grade on which to lay the tile, the difficulty may be overcome.

HOW TO SPLIT PAPER.

When drawings or engravings are printed on both sides of a sheet of paper and it is desired to file them separately, the paper may be split very satisfactorily and without injury to the drawings, says a correspondent of the American Machinist.

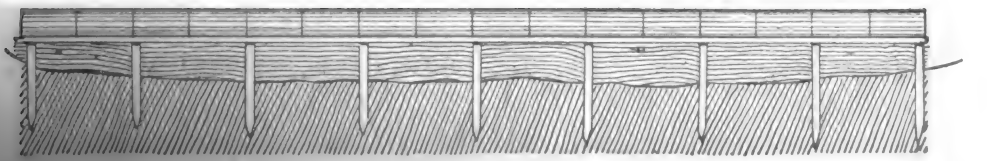
Have ready two pieces of cotton cloth, an inch or two larger than the paper to be split, some flour paste and some warm water. Cover the paper with a thin coating of the paste, dampen one piece of cloth and place on the paste side of the paper; smooth it out and so remove any air that


Splitting Paper

may be under the cloth. Treat the other side of the paper in the same manner and allow the whole to become thoroughly dry.

When dry, separate two corresponding corners of the paper, as shown in the sketch, and gently pull apart. Paper will adhere to each cloth and they must then be allowed to soak in water in order to remove. Handle carefully till dry.

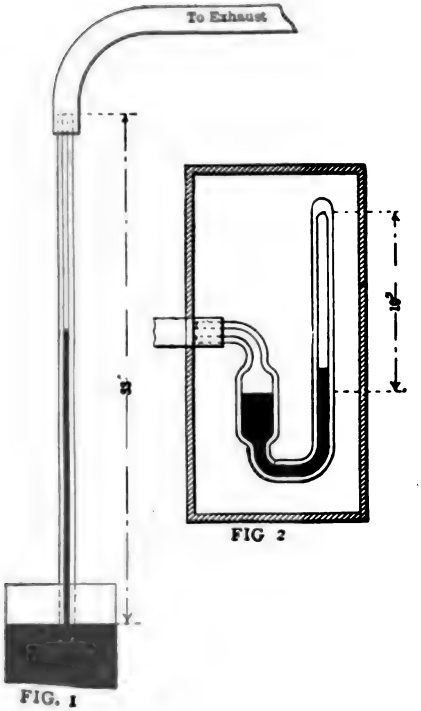
To make enough mortar to plaster 100 sq. yds. use 8 bu. of good lime, 16 bu. of sand and 1 bu. of hair.


Laying a Drain Through Marshy Land

THE MEASUREMENT OF VACUUM.

The importance of knowing just the pressure in the condenser has led to much discussion as to how it should be determined.

Fig. 1 shows one method, using the principle of the barometer, in which the mercury column is pushed up by atmospheric pressure until its weight, plus the pressure



The Measurement of Vacuum

in the condenser, equals the atmospheric pressure on the mercury in the dish. Suppose this column is 25 in. high and the barometer reads 30 in. The pressure in the condenser is equal to 5 in. of mercury. But two readings were necessary to get it. Besides this, a higher barometer reading; that is, greater atmospheric pressure, which would, of course, push the mercury up, would seem to show a better vacuum in the condenser, when in reality this vacuum was probably made less by the increased atmospheric pressure.

The best instrument is one that will: (1) show the actual pressure in the condenser, independent of the pressure of the atmosphere; (2) it must be accurate at all times.

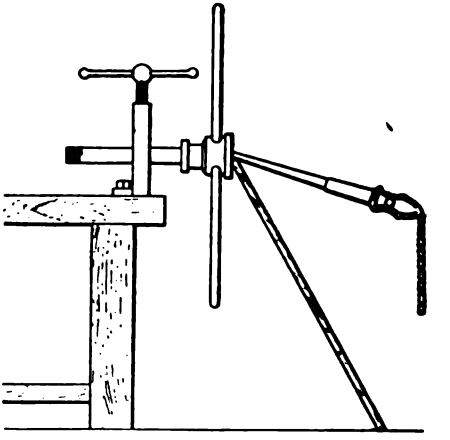
Take a glass tube, made and connected as in Fig. 2, with a vacuum above the mercury in the closed end. The difference in height of the mercury in the arms of the U tube will show quite well the actual pressure in the condenser. If the mercury rises 5 in. in the tube it means that the pressure on the exhaust side of the piston is the same in effect as if the piston were lifting a layer of mercury 5 inches thick. In a 10-inch piston this would mean a constant load of about 193 pounds at its back. This helps us to understand a 25-inch vacuum and now a still lower pressure cylinder can get work out of this exhaust steam.

The instrument in Fig. 2 is neat and cheap, and the arm at the right need be only 10 inches in length. By its use we may speak of 5 inches back pressure instead of a 25-inch vacuum.

HOW TO START A PIPE DIE.

It is possible to start the ordinary plain 2-in. pipe die on anything, save rotten pipe, by the following method, says a correspondent of the Engineer.

Take a board 6 or 8 in. longer than is necessary to reach the center of the pipe when standing on end, and with one end of



Method of Holding Stock

a bar or the handle of chain tongs in the pipe, incline the board so that the upper end comes about flush with the pipe, as shown in the sketch. Bear down on the bar, which will press the boards against the stock and so hold it firmly in position and squarely against the end of the pipe.

If you have a good kink for this department, send it in. We can use rough sketches of any size, if accompanied by brief explanations.

COLLECTING SPILLED MERCURY.

Mercury spilled on floor or table is hard to collect, as it separates into small globules which roll away at the slightest touch. A simple method of collecting it is to make a wet ring around it by means of a wash bottle or a glass, and then gather it up on a card scoop or in an envelope. The mercury cannot readily cross the wet ring.—Technics, London.

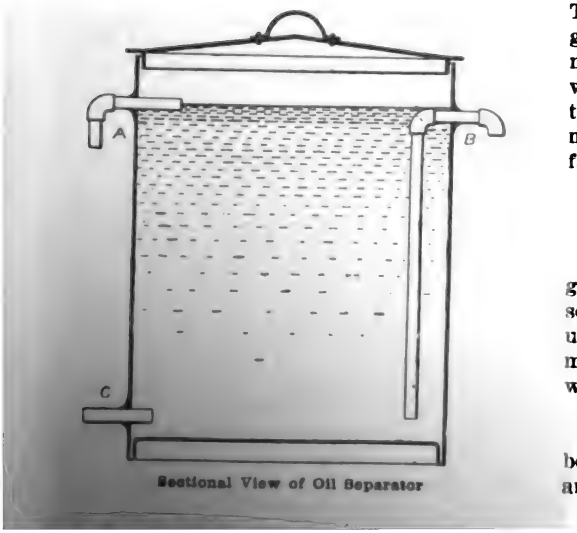
HOW TO RECUT OLD FILES AND RASPS.

Dissolve 4 oz. saleratus in 1 qt. water and boil the files in the solution for a half hour. Remove the files, wash and try them. Then to 1 qt. of water slowly add 4 oz. sulphuric acid. Immerse the files in this preparation and let stand from six to twelve hours, according to the fineness or coarseness of the files. Earthen vessels only should be used for the acid preparation. Bottle the liquid and it may be used again; but be careful in handling it, as it is poisonous.—Contributed by F. H. Olson, Loomis, Neb.

A SIMPLE OIL SEPARATOR.

For separating oil from water before filtering the oil, the apparatus shown in the accompanying sketch is efficient and can be made at home, says a correspondent of the Engineer.

A gallon oil can is used for the tank, and the pipe, C, is connected to the drip from the engine. Through this pipe, C, the oil and water enter until the liquid in the can is on a level with the pipe, A, through which the light oil floats off, while the water runs out at B, which is ¼ in. lower than A, so that the water cannot reach A. In starting the separator, to prevent any water getting into pipe B, it is well to pour enough water into the can to cover the bottom of pipe B.

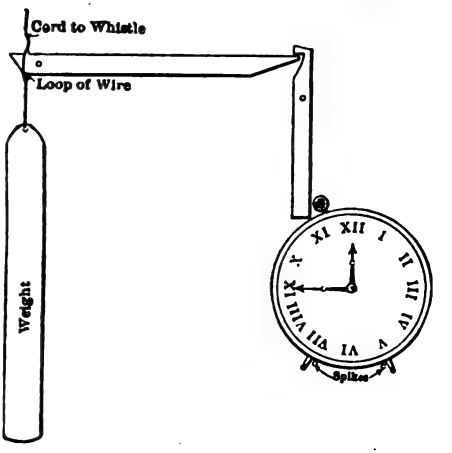


Sectional View of Oil Separator

HOW TO MAKE A TIME ALARM.

A time alarm which will blow a whistle at the time it is set for is very easily rigged up as shown in the sketch.

A weight is attached to the whistle cord



A Simple Time Alarm

and hung up by a loop of wire on a trigger working loosely on a nail. The other end of this trigger is set under the hook of another loose trigger. An alarm clock having the bell removed is set against the wall by means of spikes on which the legs rest. The clock is near enough to the second trigger so that when the alarm rings the hammer will strike the trigger and release the weight, which falls with a jerk and so blows the whistle. A little slack in the cord running to the whistle will cause the weight to fall with a jerk.

HOW TO CLEAN PAINT KETTLES.

Add half a pound of caustic soda to two gallons of water, and boil the kettles in the solution. The caustic acid may again be used for the same purpose several times, or may be used for cleaning paint from woodwork, says the Master Painter.

A good furniture oil is composed of 1 pt. boiled linseed oil, 4 oz. yellow wax melted and colored with alkanet root.

SET SCREW POINTS.

In obtaining a point on set screws which are to be used on threaded collars, the method shown in the sketch is excellent, as it entirely stops annoyance with soft metal points.

To procure the points is a very simple matter. In Figs. 1 and 2 is shown part of

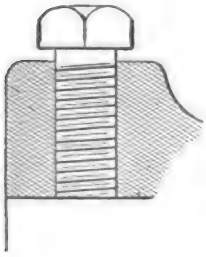


Fig. 1

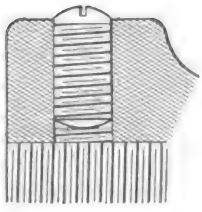


Fig. 2

an adjusting ring for the blades of an adjustable reamer. Rough bore the hole, leaving enough stock so it can easily be rechucked and finished; drill and tap the hole for a set screw and screw a wrought-iron cap bolt in the tapped hole, as in Fig. 1. With a hand die cut the extreme end of the cap bolt small enough to be a "sloppy" fit in the tap hole, this being done to insure enough lateral play in the end to be used as the "point," so that the set screw will force it tightly upon the male thread which the adjusting ring is to fit. Rechuck the ring and bore and cut the thread in it in the usual way. This being done screw the cap bolt out of the hole, and cut off a piece, as shown at Fig. 2, with two or three threads of the original cap bolt on it and the same thread in the end as the adjusting ring. Caseharden the wrought-iron "point" so made and screw in to the adjusting ring (see Fig. 2) until it is in the same position it was in when the internal thread was cut in its end.

Points properly casehardened, says a correspondent of the American Machinist, will not expand under the ordinary pressure of the set screw and cannot mar the threads they grip.

DARK GREEN PAINT FOR VEHICLE GEAR.

When painting the gear of a vehicle dark green add a little chrome yellow, or chrome green, if preferred, to the black for the first coat, and for the second coat add the same to black rubbing varnish.—John L. Whiting & Sons' Book, "What Else to Do."

BAND SAWS AND HOW THEY ARE MADE.

The very best steel obtainable, combining qualities of toughness, elasticity and edge-holding is used for band saws. The saws are rolled from large pieces of the steel until of the right thickness (the standard is 14-gage) and are then left for grinding and polishing.

Band saws are heated for tempering in large furnaces 75 to 100 ft. long. When at the right heat they are taken out and plunged into a long trough filled with whale oil, and when cold the teeth are punched by an automatic machine. If, when tested for its temper, it is either too soft or too hard, it must be retempered.

The blade usually comes out badly twisted after tempering, says the Wood-Worker. Some are long-face twists and some cross-face twists, then comes the cross-line twist, which runs the entire length of the saw. Sometimes part of the saw will have long-face twists and part cross-face twists. All twists are taken out of blade with the cross-pein hammer, and tension put in with the round-face hammer to the amount desired. Tension levels are used that are made on a circle, so as to have the tension even throughout the saw.

The blade is then ground between two large grindstones running opposite directions from one another. Great care is taken in grinding to keep the stones true so as to grind the saw alike on both sides. Should one stone become hollow-faced and the other remain square, you would find the saw blade to be ground level on one side and rounding on the other. It would be impossible to level such a saw alike on both sides.

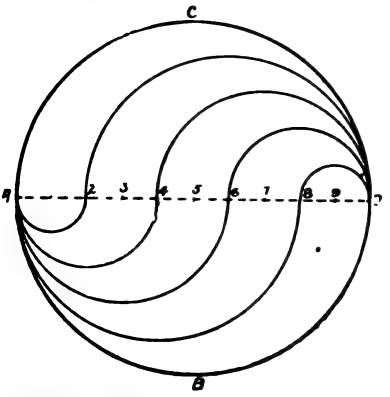
After being ground, saws are polished and brazed together, but are always hammered and tensioned before they are put together.

TO FINISH SPRUCE.

Wet the surface of the spruce with dilute sulphuric acid and allow it to dry. Hold over a heated stove until the whole surface is as black as charcoal, then with a stiff scrubbing brush, remove all the charcoal that will come off. Oil the surface with linseed oil and beeswax. This treatment brings out the harder grain in black and gives the rest a brownish tone. This finish is used in Japanese work, says the Manual Training Magazine.

TO DIVIDE A CIRCLE INTO ANY NUMBER OF PARTS OF EQUAL AREA.

Let ABCD be the circle, to be divided into five parts of equal area. Divide the diameter, AD, into a number of equal parts twice as great as the number of parts desired in the circle—in this case, five. Number the points as shown. From 1 as a center, draw



Dividing a Circle into Parts of Equal Area

a half-circle through A and 2 on one side of AD, and from 6 as a center, strike a half-circle through 2 and D, on the opposite side of AD. In the same way, taking as centers 2 and 7, 3 and 8, and 4 and 9, the remaining half-circles are drawn, giving the required equal areas.

OIL THAT COLD WILL NOT AFFECT.

It is often difficult to keep machinery properly oiled in cold weather, as the oil freezes in the oil holes and the cups, and the oil upon the ways of the lathe and planer becomes stiff, causing the machines to work hard. A good oil for winter use is made by mixing graphite with cylinder oil until in a thick or pasty consistency, and then adding kerosene until it flows freely. This oil will not become stiff at 14 degrees below zero, and is valuable to those operating machinery outside or in cold shops.—Contributed by Paul S. Baker, Muscatine, Iowa.

Concrete which is well-proportioned will safely withstand a crushing strength of 50 tons per square foot, it is said. Most American cities limit it to 16 tons per square foot, however, in their building laws.

CEMENT FOR LEAKS IN IRON PIPE.

A cement for closing leaks in iron pipe consists of coarsely powdered iron borings, 5 lbs.; powdered sal ammoniac, 2 oz.; sulphur, 1 oz., and water sufficient to moisten it. This composition hardens rapidly; but if time can be allowed it sets more firmly without the sulphur. It must be used as soon as mixed, says the Mechanical Engineer.

TO MAKE GAS ENGINES NOISELESS.

To make a gas engine noiseless, the following simple device can be introduced by anyone at a small expense, says an English journal: A pipe split for a distance of about 80 inches is attached to the end of the exhaust, with the split end upward. Beginning at the lower end of the cut, which may best be made by a saw, dividing the pipe into two halves, the slotted opening is widened out toward the top until it has a width equal to the diameter of the pipe. The puff of the exhaust spreads out like a fan, and the discharge into the open air takes place gradually. The effect produced is said to be remarkable, but it depends somewhat on the flare of the tube.

SAFETY FIRE BUCKET TANK.

The fire bucket is a constant temptation to the workman who happens to need a pail and can't find one handy. The fire buckets to be of use when really needed must be in handy places. If they are set around on the floor they are either in the way or soon disappear. If hung up on nails or hooks or placed on shelves they dry out and are often found empty and ready to fall to pieces when the fire comes. An Eastern concern has conceived a practical solution of the fire pail problem by using a galvanized iron tank partly filled with water in which the pails are kept. A lid to the tank keeps out dirt and prevents evaporation.

FLANGED WHEELS.

Faulty Systems and How They Could Be Improved

The flanged wheel, undoubtedly, is very destructive in its effect upon a belt. Some manufacturers of belting state in their contracts that the radial flanges often used to keep belts on pulleys shall be dispensed with. The flanges are used oftentimes simply to overcome some imperfection in the alignment of the wheels or shafts. Again they are employed to guide the belt correctly on a wheel which is of too small diameter, too wide or too narrow, or in which the belt system itself is defective, and the belt cannot be kept in proper line.

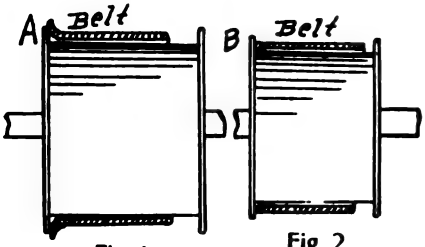


Fig. 1 Fig. 2

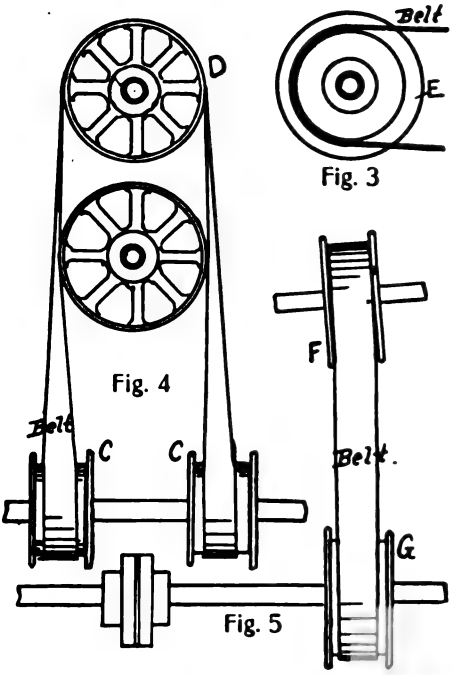


Fig. 3 Fig. 4 Fig. 5

There are several reasons why the shoulders or flanges of wheels are often seen in use, even in these days of apparently perfected power and transmission. Of course the effect upon the leather, rubber or canvas belt of the flanges is to tear and wear the edges in a short time—sometimes in a very few weeks after the belt is installed. In the cuts are shown some illustrations of defective systems of flanged wheels that came to notice recently.

The wheel system shown in Fig. 1 was found in use in a flour mill. There had been considerable trouble in keeping a certain belt in line on some overhead shaft wheels, and in order to overcome certain other defects a wheel was put on with the flanges as shown. The result was that the belt stayed on the wheels, but it constantly rubbed against the flange, as at A, resulting in ruining that edge of the belt in a short time. Some overhauling was done, and the belt was caused to run within the flanges, but still it rubbed against the side of the flange, as at B, Fig. 2. In course of time the edge of the belt was wrecked and a new belt had to be put on. The error in the flange system of deflecting the course of a belt is that the flange has to deflect the belt after the belt has already taken its grip on the wheel. The way to deflect a belt on a wheel is to exert the pressure upon it sidewise to the right or left, so that it will pass to the wheel spirally. This is done by applying the pressure before the belt gets hold on the wheel surface. The flange cannot do this. Fig. 3 shows the belt passing to the wheel, contacting with the flange E. There are occasions on which the flanges happen to come right, and the belt takes its course without danger of being worn by frictional contact with the wheel guides. But this is rare. Usually the flanges create trouble, more or less.

A system of right-angle drive was fitted up in a machine shop, as in Fig. 4, with the flanged wheels C, C. Many have used this form of drive, and usually made the belt stay on the wheels without the use of flanges on any of the pulleys. Sometimes when the system is installed and apparently complete, it is found necessary to turn the belt in the opposite direction, causing the belt to run off. Then the flanged wheels are clapped on. The driving pulley in this system is marked D. The pulleys C, C, turn in opposite directions on the shaft, and therefore need to be on independent sleeves, with a collar on each side of each sleeve.

This system is sometimes used instead of the half-cross method. The belt, however, has to be twice the length than for the direct driving. With proper setting the system can be run readily without flanged wheels.

In another establishment a belt was apparently laboring along between the flanges of a wheel, as at F, Fig. 5, and the floor and parts of machinery just below were liberally sprinkled with the grindings of the costly leather belt, chafed from the edges by the flanges. An inspection quickly determined the cause. The shaft carrying the wheel, F, was quite a distance out of line. The pulley, without its flanges, was unable to retain the belt on. Therefore, rather than re-adjust the shaft, a pulley was keyed on with flanges. The flanges kept the belt on, but the effect upon the belt was beginning to tell, and no doubt by this time the belt is upon the waste pile of the shop. A little re-adjusting of the shaft, making the parallel alignment true, would have overcome the defect at once and for good. The driving pulley of the system, G, was likewise flanged. The half-crossed belt running upon flanged wheels with disastrous results to the belting was found also in a number of cases. Some of the highest grades of belting were receiving unjust treatment from these flanges.

In the half-crossed system, heavy belts of narrow width are of course the best. Fortunately, the heavy, narrow belt is not so readily torn and worn by the flanges. Often the tough little double belt will run for a long time, grinding against the flanges, before signs of wear are observed. But even the double belts, tough raw-hide belts, and belts made specially to resist wear and tear, cannot stand the cutting, breaking, grinding, chafing flanges indefinitely. The cone pulley is, in one respect, a form of flanged wheel, for the reason that one side of the wheel in use must always be provided with a higher shoulder than the other side. Yet it is very seldom that the change or the cone pulleys destroy belting. As the flange or shoulder exists on one side only in each instance, it is possible to adjust the system so that the belt will always run so as to clear the shoulder. In the cone wheels the faces are made flat or parallel, as a rule. In special cases, however, convexing is advised. Such faces are also made with recesses, but so slight that the fact is scarcely felt by the belt. It is the abuse of the cone wheel that causes trouble with the belts. The one-cone wheel system, adjusted in the manner shown in Fig. 6, was found in a wood-working establishment. The outer pulley surfaces of each wheel at both sides were flanged at H and I. The shaft carrying the lower cone was out of true, and, to further add to the complications, a shifter was in use at J, manipulated by the lever and rod K. The belt was constantly abrading against the flange, and gave signs of

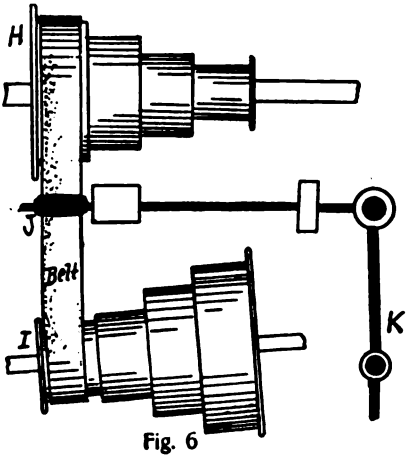


Fig. 6

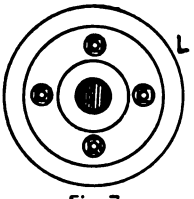


Fig. 7

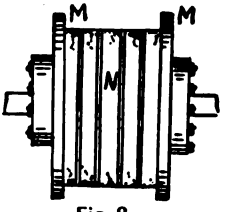


Fig. 8

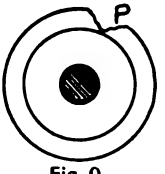


Fig. 9

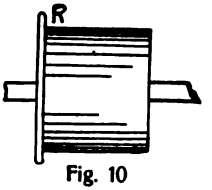


Fig. 10

breaking and tearing. The edges were scraped badly. When asked why the shafts were not properly lined so as to overcome the trouble, the response was that they did not have time to fix it. Belting is an expensive proposition. It will pay to take the time.

As to building up wheels with flanges, this ought not to be encouraged. Yet there are occasions in which it is perfectly proper

to use the flanged wheel. It is wrong only when some one claps on a flanged pulley to keep a belt in line when the belt runs untrue because of defective adjustments of the shafts or wheels, or the belt unions are unevenly closed and the belt wabbles as a result.

In Fig. 7 is a drawing of a home-made flange. The flange proper is L, and is part of the side which may be adjusted to the interior disks, so as to form the flanged wheel of the pattern shown in Fig. 8. The flanges are marked M, M. The disks are of wood, turned from hard stock, to right size at the nearest wood-working shop. The disks are bored through for the bolts of the flanges, and quite a substantial flanged wheel results.

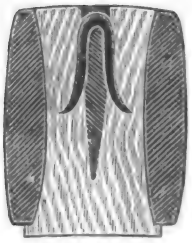
Fig. 9 is a sample of what we often see. It is a piece broken out of the flange of a wheel. This fracture makes a rough place, and unless a remedy is sought the sharp, ragged edge will cut and ruin the belt. Broken pieces are sometimes riveted back in place. Fig. 10 is a sketch of the one-flange wheel. The flange is marked R. This type of wheel may be found in service in some places.—"Traveling Machinist."

RAISING A HEAVY TIMBER WITHOUT TACKLE.

A heavy stick of green timber 12 in. x 14 in. and 48 ft. long was raised to a height of 7 ft. 6 in. in fifteen minutes without the use of tackle by C. J. Case of Troy, Pa., and one assistant. The timber was raised as shown in the sketch, by see-sawing it and building up a crib of blocks beneath it. Each time one end of the timber went up a new block was placed, the work proceeding in this manner until the desired height was attained.

WEDGE FOR HAMMER AND TOOL HANDLES.

An English tool maker has put on the market a metal wedge for securing heads of hammers and other similar tools. A malleable iron wedge is provided with a short traverse slot at its thicker end. This wedge is driven into the shaft of the hammer, and a staple is then driven in astride the slot, its ends opening out as shown in the accompanying illustration, thus preventing the wedge from coming loose.



ROOFING PAINTS MADE OF GAS TAR.

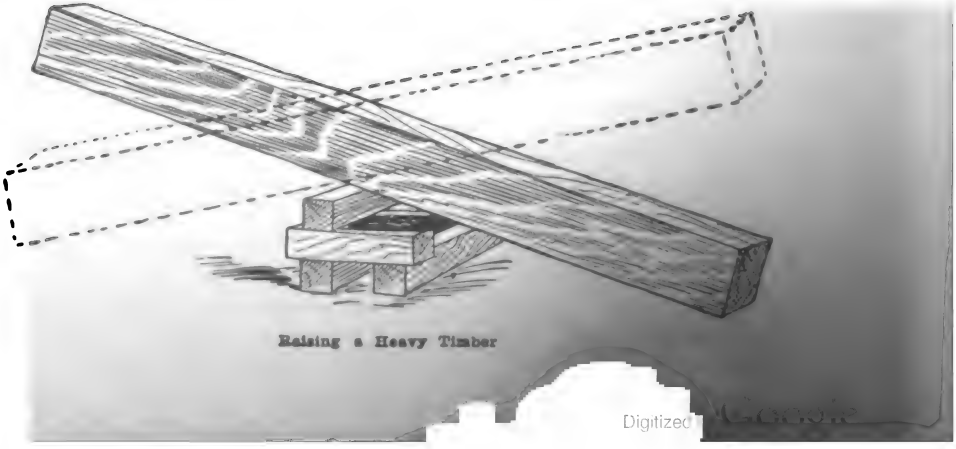
The following recipe is one of the very best for a roofing paint made of gas tar:

Take 30 lbs. each of coal tar pitch and cheap asphaltum; melt and boil slowly over a slow fire for five hours; add 8 gals. boiled linseed oil, and then add slowly 10 lbs. each of red lead and litharge. Boil three hours longer. Take from fire and thin, while still warm, with enough turpentine or benzine to make it work freely.

This is, however, a rather expensive paint and also considerable trouble to compound. A much simpler and at the same time reliable paint may be made as follows:

Take 3 gal. liquor coal tar and mix with it 1 gal. benzine asphaltum varnish, which may be thinned with either turpentine or benzine to working consistency.

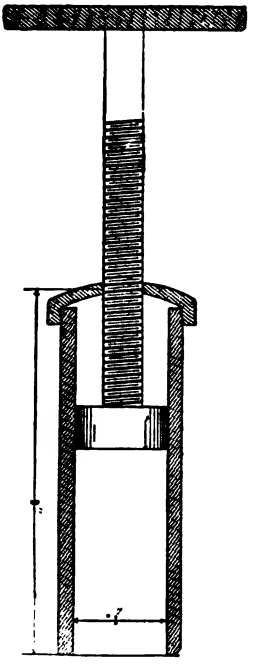
An excellent flux for copper, tin or arsenic is powdered flint glass.



Raising a Heavy Timber

COMPOUND FOR USE ON COMMUTATORS.

A good compound for use on commutators which will prevent them from sparking or cutting and will keep them in good shape, is made as follows:



Two parts of the best paraffine wax melted and allowed to come to a slow boil, into which is stirred one part of baking soda. Stir for two minutes and add one part of the best and finest graphite. Keep stirring and let remain over the fire for three minutes. Pour into mold.

Any sort of a mold may be used. The one shown in the sketch is used by a correspondent of Power, and molds a stick 9 in. long and 1 in. in diameter. Cut up into sticks 4½ in. long and wrap separately in tinfoil until needed. Treat commutator lightly once in awhile.

ANOTHER METHOD OF USING SANDPAPER.

Fold the sandpaper three-ply. Face a piece of common rubber of suitable size and an inch in thickness. Place the sandpaper on the work, and upon this the rubber, and begin work.—Contributed by C. L. Truesdale, Sharpsville, Pa.

HARD SOLDER FOR SILVER.

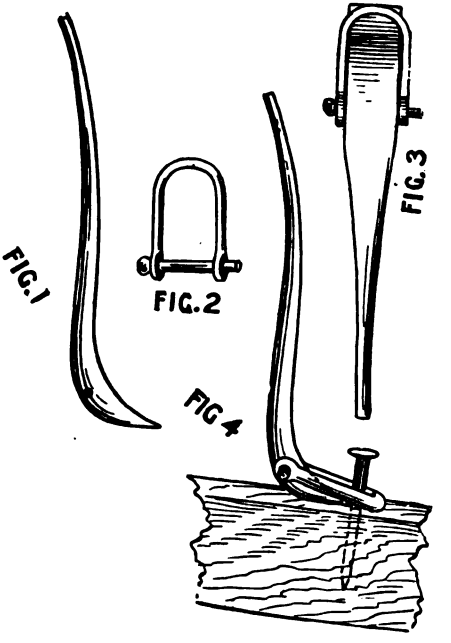
Equal parts of silver and brass make a good, hard solder for silver, which will fuse much easier, however, by the addition of 1-16 part of zinc.

In soldering either silver or gold it is well to draw the solder into a wire, or to flatten between rollers and then cut into small bits, which may be used as required. To perform the work first join the parts to be soldered together with fine, soft wire. Have ready some finely powdered borax, well moistened with water, into which dip a camel's hair brush, and touch the joint to be soldered, placing a little solder on the joint. Apply a large piece of charcoal to the joint, and then with a blowpipe and lamp blow upon it through the flame until the solder melts.

To cleanse the article after the soldering has been done heat it red hot and let it cool. Then boil it in alum water contained in an earthen vessel. The cleansing will be perfect.

A GOOD SPIKE PULLER.

The spike puller here illustrated is made of a 2½-ft. steel bar in the form shown at Fig. 1, and has a clevis made as shown in Fig. 2, and measuring at the side 3 in., and at the ends 1¼ in. The method of attaching the clevis to the steel bar by means of a pin is shown at Fig. 3, while Fig. 4 shows the position of the tool in use. This is an



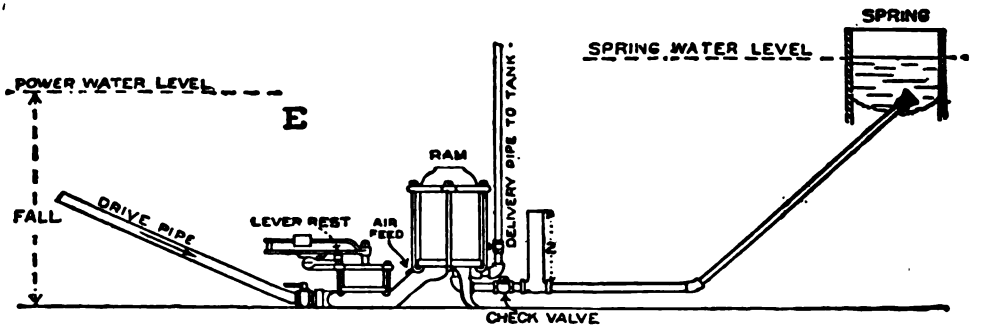
excellent tool for the purpose, and will pull rusty spikes as well as new ones.—Contributed by C. J. Case, Troy, Pa.

The best varnish for iron is a thin coat of red lead, laid on and allowed to dry, then one or two coats more added. Allow each coat to dry before applying another.

HOW A HYDRAULIC RAM WORKS.

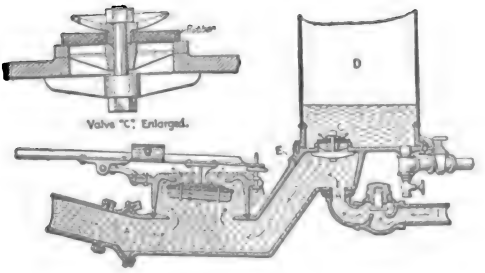
(Published in response to numerous requests.)

The invention of the hydraulic ram is credited to Michael de Montgolfier in 1796. The inevitable improvements since then include greater efficiency and the ability to pump a different water than that which furnishes the power; that is, impure and unusable water may be made to pump good water. Rams are now made to operate with a fall as small as 18 in., and up to 50 ft. Under certain conditions water can be raised 30 ft. for each foot of fall used. A first-class ram requires little attention and ought to run an entire season without repairs. They will not, of course, work when exposed to freezing conditions, but pipes can be buried and the ram housed to operate continuously.



Double-Acting Ram--Pumping Pure Water with Impure Water for Power.

The cut shows a view of the so-called double-acting ram, one which pumps pure water by using impure water for power. Considering it first without regard to the double-supply feature, suppose the opening at H to be closed. The valve at B being open, the water from the source of supply at more or less elevation above the machine flows down the drive-pipe A and escapes through the opening at B until the pressure due to the increasing velocity of the water is sufficient to close the valve B. At the moment when the flow through this valve ceases, the inertia of the moving column of water produces the so-called ramming stroke, which opens the valve at C, and compresses the air in the air chamber D until the pressure of the air plus the pressure due to the head of the water in the main, is sufficient to overcome the inertia of the moving column of water in the drive-pipe. This motion may be likened to the oscillations in a U-tube. At this instant the column of water in the drive-pipe has come to a rest, and the air pressure being greater than the static head alone, the direction of motion of the moving column is reversed and the valve C closed. The water in the drive-pipe is then moving backward, and with the closing of C a tendency to a vacuum is produced at the base of the drive-pipe; this negative pressure causes the valve B to open again, completing the circle of operations. At the moment of negative pressure the little shifting valve E, admits a small quantity of air, and the following stroke this passes into the air chamber, which would otherwise gradually fill with water, the air being taken up by water.



Details of the Ram.

The Mediterranean motor boat race from Algiers to Toulon ended disastrously. Seven craft were entered and were convoyed by a whole fleet of cruisers and destroyers. Every motor boat but one sank and the one spared was carried aboard its convoyer to Toulon, which place was decorated with triumphal arches to receive the winner. The affair turned out rather ridiculously considering that the English government lent its aid at a cost of $140,000.

INSULATING STEAM DOMES AND PIPING WITH HAIR FELT.

Where a high pressure is carried and there is considerable heat radiation it is economical to cover steam domes and piping with non-conducting insulating material. A correspondent of Power tells how he covered two steam domes and a large amount of 2-in. piping with hair felt. The domes in question were 4 ft. 6 in. high by 4 ft. wide, and to cover them one would proceed as follows:

Around each dome fit asbestos board ¼ in. thick and wire it on securely. Cut 16 pieces of wood 1¼ in. square, 4 ft. 6 in. long, and each having three slots cut in them (Fig. 2) 4 in. long and ⅝ in. deep. Set eight of these pieces at equal distances around each dome in a vertical position with slots toward the asbestos board (Fig. 1). Wire these in place also, and then put on another layer of ¼ in. asbestos board. Wrap this with strong twine, to hold it in place, and then wrap on hair felt, a layer 1½ in. thick. Wind on twine to hold this secure and, keeping the surface smooth, cover the hair felt with asbestos paper, and finally cover the whole with canvas properly sewed and painted. Treat the top of the dome in the same manner, except that the asbestos should be cut by a paper templet made to fit the safety valve, main stop and 2-in. connection, and radial strips of wood should be used instead of vertical pieces. Fasten these to the vertical strips with wire nails. Fig. 3 shows a sectional view of the covering. With this covering the hand can feel no heat when the boilers are under steam, the temperature of the boiler room will be reduced and made more comfortable, and fuel expense will be lessened.

Cover piping in the usual manner, except in applying the asbestos paper. Cut this into strips wide enough to go around the pipe, wet it and wrap around the pipes. It will not need twine to hold it if put on while wet. Cover the asbestos paper with hair felt and then another layer of asbestos paper to give a smooth surface, and finally the neat covering of canvas.

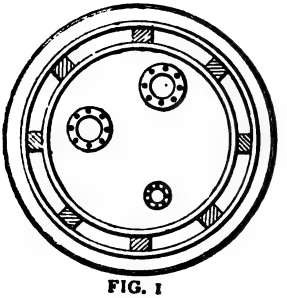


FIG. 1

FIG. 2

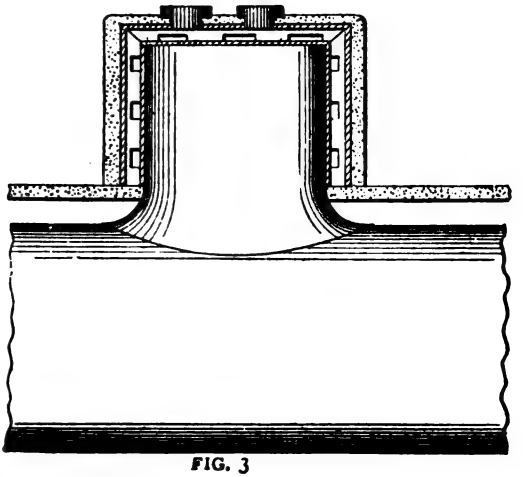


FIG. 3

Covering a Boiler Dome With Hair Felt

To remove ink stains from ivory use repeatedly a solution of quadroxalate of potash in water.

HOW TO FIND THE NORTH AND SOUTH POLES OF A DYNAMO.

While the dynamo is in service, bring the north-seeker end of a compass needle near each of the poles. Those that attract this end are north poles and those repelling it are south poles.

HOW TO TEMPER SPRING STEEL.

Heat to a cherry red and plunge into cold water. This will harden it; clean with emery cloth. To draw the temper, place in clean hot sand until the colors run to blue. Then place in cold water. Repeat the sand process if still too hard.

The 1905 Shop Notes is an excellent ready reference book for emergencies, full of short cuts and original kinks. Only 50 cents.

FIRST THINGS TO DO IN CASE OF BURNS, OR SCALDS.

Three classes are generally recognized:

1. Simple reddening of the skin.
2. Accompanied with the formation of blisters.
3. Charring of the skin and ulceration of all degrees up to complete destruction of the part.

Burns of the second and third degree, especially when covering large areas, require immediate medical attendance. In severe burns there is liability to shocks and prostration. The general directions for treatment of such a case would be to transport the patient to a place of safety, then remove clothing by cutting away with a knife or scissors. If the clothing sticks, do not pull it off, cut around it and wet it with water or oil, promptly exclude air by covering the wounded or injured surface.

As the pain attending a burn is very intense, care should be taken not to expose too large a portion of the surface to the air at any one time, and to cover as quickly as possible with something that will exclude the air. This should be done the moment the covering is removed. When the burn is extensive, expose and dress a small portion of the burn at a time.

Never hold the burn to the heat, but warm moist cloths are sometimes grateful, especially if wet with a warm solution of baking soda (bicarbonate).

When a person's clothing catches fire, make him lie down immediately or throw him down if necessary. Wrap him quickly in a blanket, cloak or shawl, preferably some woolen material, and smother the fire by pressing and patting upon the burning points from the outside. Have water ready, and in removing the wrapping pour the water over the burning point.

Serious degrees of shocks usually follow such burns. In cases of severe shock it is heroic treatment to lay the person on a sheet and lower him, clothes and all, into a bath tub full of water, moderately warm. This will relieve the pain and shock.

It is best in these cases not to attempt any dressing of the burns, simply to cover them with a layer of gauze, then a layer of lint, over this a layer of absorbent cotton, outside the whole a sheet or blanket, and await the arrival of the physician, or transport the patient to a hospital.

In slight burns or scalds, put a teaspoonful of baking soda in a pint of boiling water; stir well; in this dip a piece of lint and carefully cover the burns and scalded places; cover this with absorbent cotton, and finally wrap with the triangular or roller bandage.

In more severe cases, saturate lint with perfectly fresh salad oil, olive oil, sweet oil, vaseline or petrolatum. In the absence of these, the white of an egg may be used. A very common practice is to apply carron oil (equal parts of raw linseed oil and lime water). In absence of oils, dust the burned part with starch, flour or toilet powder or if nothing else is available use moist earth or clay. Cover the whole with a layer of lint, over this a layer of absorbent cotton, and finally wrap with a triangular bandage.

Burns from caustic lye, strong ammonia and similar substances, should be first thoroughly flooded with water and then with vinegar, and subsequently treated as if burned by fire. Burns from acid, vitriol, etc., should be first flooded with water and then washed with a solution of baking soda or lime water. If nothing else is available, take chalk, tooth powder or a portion of mortar from the wall, crush it and stir it up with water and apply on lint to counteract the acid. After washing, treat as a burn by fire.

Use a weak solution of washing or baking soda in the case of drinking an acid. For other burns of the inside of the mouth or throat caused by drinking hot fluids or swallowing chemicals, apply oil or the white of an egg, by drinking, or pouring from a spoon. In the case of caustic potash, ammonia and the like rinse the mouth and throat with weak vinegar. If a fragment of lime gets into the eye, don't try to take it out but flush with water and bathe it with diluted vinegar or with lemon juice, a teaspoonful of either to a cup of warm water.

In cases of frost-bite, carry the patient to a closed room without a fire, undress carefully, and rub the frozen parts, or the whole body with snow or bits of ice, otherwise put patient in cold bath, keeping up a vigorous rubbing of the surface affected; warm coffee or tea may be given as a stimulant. If the person has ceased breathing, use methods of artificial respiration. As the patient revives, carry him to a room slightly warmer, and cover loosely with a blanket. Afterward rub with a cloth wet with warm water, whiskey, or with diluted alcohol.

Treat cases of sunburn as mild scalds, covering with a weak solution of baking soda, oils, vaseline, or with white of an egg, then with lint and bandage.

When users of wood furnaces experience difficulty with creosote dripping from the smokepipe, the simplest remedy is to reverse the lap of the pipe, so the condensation will drip into the furnace.

HOW TO SOFTEN IVORY.

Into 1 qt. of vinegar slice ½ lb. of mandrake. In this immerse the ivory and let it stand 48 hours in a warm place. At the end of that time it will be possible to bend the ivory into any form desired.

AN EASY RULE FOR CIRCUMFERENCES.

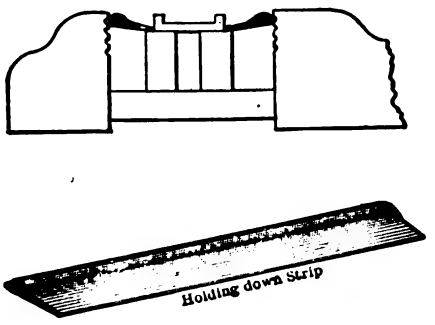
The rule that 11-14 of the diameter equal ¼ of the circumference is close enough for any business calculation, and will often save much figuring.—Contributed by C. J. Case. Troy, Pa.

TO REMOVE STAINS FROM MARBLE.

Take two parts of soda, one of pumice and one of finely powdered chalk. Sift through a fine sieve and mix into a paste with water. Rub this composition all over the marble and the stain will be removed. Wash it with soap and water, and a beautiful bright polish will be produced.

HOLDING DOWN WORK IN SHAPER AND PLANER VISE.

Strips, such as shown in the sketch, afford a simple means of holding down work in shaper or planer vise. Small, half-round grooves are planed 1-16 in. wide in the faces of both jaws of the chuck, and the round



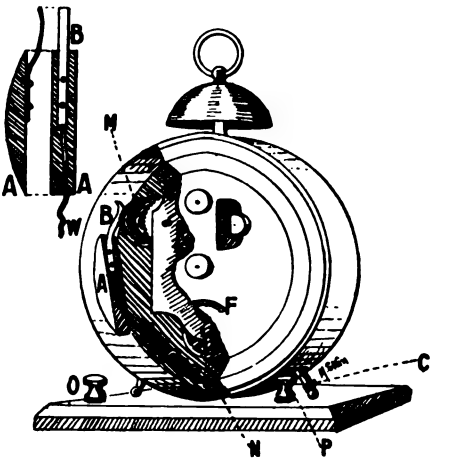
Holding Down Work in Shaper and Planer Vise

edges of the strips, if made to fit, will not kick up, says a correspondent of the American Machinist. The grooves are so small that they do not injure work held directly against the faces of the jaws. The strips can be placed so as to accommodate different heights of parallels and different thicknesses of work.

TO CONVERT AN ALARM CLOCK INTO AN ELECTRIC ALARM.

An ordinary alarm clock may be converted into a very satisfactory and efficient electric alarm by the method here illustrated:

The device consists of a segment of wood, A, having its radius equal to that of the



An Electric Alarm

interior of the clock, so as to fit snugly against it. To this segment the brass spring, B, is attached by two brads, and to this spring the insulated wire, W, is soldered. The segment of wood is then glued to the interior of the clock in such a position that when the alarm spring, M, unwinds it will press against the brass spring, B. A small hole, N, is made in the bottom of the clock, through which the wire, W, is passed. Care must be taken to insulate the brass spring, B, and the wire, W, from the rest of the clock. The clock is then mounted upon a suitable base, and the wire, W, is passed beneath this and attached to the binding post, O. A wire from the binding post, P, is passed through a hole in the base and wound about one leg of the clock at C. An electric bell and a dry cell are attached in series with the clock by the two binding posts, and the alarm is wound up. As the spring, B, and wire, W, are insulated from the rest of the clock no circuit is formed; but when the alarm goes off the spring, M, unwinds and forms a contact at B, thus completing the circuit.—Contributed by Milton F. Stein, Chicago.

Shellac may be bleached by exposing in thin threads to the atmosphere.

WITH PINS, STRING AND COMPASSES.

Take a string and make a loop one inch long. Stick pins at the points D and D', Fig. 1. Put the loop over the pins, and, with a sharp pencil catch the loop and run the

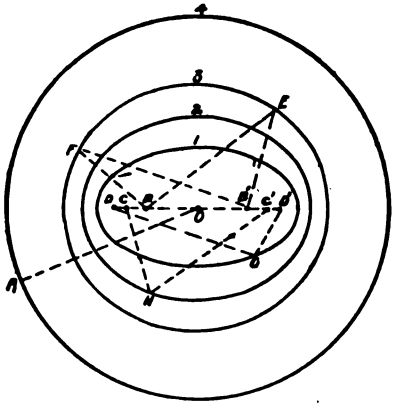


Fig. 1 With Pins, String and Compasses

pencil along it. Ellipse 1 is drawn. Use the same loop, putting pins at the points, C and C', and draw ellipse 2. With pins at B and B' curve 3 is made. Placing the string over a pin at the center, O, we get with radius OA, curve 4, a circle. The points B and B' and C and C', etc., are called foci of their respective ellipses. This work depends upon the law that the sum of the distances of any point on the curve from the foci is always the same; for example, taking curve 3, BF plus FB', is the same length as BE plus EB'.

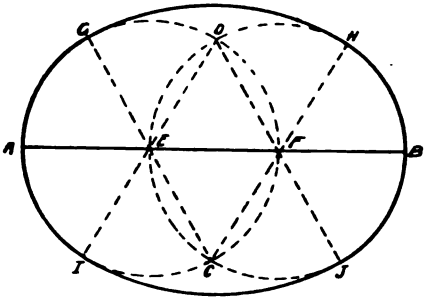


Fig. 2. With Pins, String and Compasses

To draw a curve (ellipse) like Fig. 2, when the length, AB, is known, proceed as follows: Divide the line (axis), AB, into three equal parts by points E and F. From E and F as centers, and a length equal to one-third AB, draw the circles IFG and HJE. Through C and D, where the two circles intersect, draw CG, CH, DI and DJ. From C as a center, strike the curve GH, and from D as a center draw the curve IJ. AGH—BJI is the required curve or ellipse.—Contributed by C. L. Truesdale, Sharpsville, Pa.

HOW THE STEAM TURBINE OPERATES.

Usually the explanation of the operation of a steam turbine is "written so you can't understand it;" the following, condensed from the Engineer, London, is a clear and simple explanation of a complicated question:

We take the Laval turbine as the simplest type of the machine. In it steam, as is well known, is allowed to blow against vanes on the rim of a wheel. These vanes are cupped in order that the steam recoiling from the wheel may return, so to speak, on itself. Very little thought is required to show that if the curve of the cup is of the proper shape, and the tangential velocity of the cup—that is to say, the speed with which it moves away from the jet—is half that of the jet, the steam will leave it without any velocity whatever, and the whole of the energy in the jet will have been transferred to the wheel. Now, at this point the circumstance that steam is an elastic fluid comes in to cause mental confusion. It is hard to credit the statement that an elastic fluid can really leave anything with which it has been in contact without velocity. The fact which our readers must get into their heads is that in the Laval turbine the working steam is not an elastic fluid, and has no pressure. To make this clear, let us suppose a Laval wheel of 100 horsepower using 20 lbs. of steam per horse per hour, that is to say, 2,000 lbs.; and per minute, leaving out fractions which we do not want, 33 lbs.; and per second a little over half a pound of steam. Now, the steam issuing from the boiler has a pressure of, say, 150 lbs., but it is permitted to escape through a diverging nozzle, and the pressure is all expended in imparting velocity to the steam. Let us divest ourselves of all ordinary concepts about steam, and fancy that it ceases to be a fluid exerting pressure and becomes a torrent of very fine shot projected at a velocity of about 5,000 ft. per second, or nearly twice that of a rifle bullet, against the vanes of the turbine. We have no longer an elastic fluid to deal with; we have half-a-pound of something which may be regarded as solid—at least, in the sense that the water in a Pelton wheel is solid—moving at the

enormous velocity we have stated. The work done by the steam entering the nozzle is entirely expended in pushing the molecules away in front of it through the nozzle and out at the other end. Each group of molecules, in a sense, acts the part of the charge of powder in a rifle to make those in front of it fly faster. To put the facts in another way, the result is just the same as though a stream of fine sand fell into a steam jet. The jet would impart its energy to the sand, and if the sand were directed into the vanes of a Laval turbine it would cause its rotation. Instead of sand we utilize the molecules of the steam. With these facts before us, we see why the velocity of the rotating wheel of the Laval turbine must be so high. It has to attain a speed of about 2,500 ft. per second, or over 1,700 miles an hour, in order that the whole of the energy may be transferred to the wheel. It will be understood that, as far as the wheel is concerned, the steam has ceased to be an elastic fluid. It may be considered in the light of a shower of fine projectiles impinging on the vanes at an enormous velocity. Hence the revolutions of even as much as 30,000 per minute, in the smaller turbine.

The same effect takes place in the Parsons type of turbine, but the action is masked by the absence of the diverging nozzle. Divergence takes place inside the wheel casing, the steam expanding from step to step downwards. Quoting from Mr. W. F. Durand, an American engineer, we may say that, in turbines of the Parsons type, "the steam rushes from the steam supply to the condenser through the annular space between the wall of a long cylindrical casing and the contained rotor, increasing the cross-sectional area from the entering to the delivery end. This annular space thus constitutes in effect a gigantic nozzle within which the steam is continually undergoing transformation as it passes from one end to the other;" that is to say, it ceases by degrees to be an elastic fluid and becomes instead a furious torrent of molecules.

It is not necessary here to refer in any detail to the precise way in which the flying molecules of steam transfer their motion to the vanes. The major difficulty met with by those who want to understand the steam turbine is how a free elastic fluid can transfer its energy to a rotating wheel. The only way out of the difficulty is to say that the steam is not an elastic fluid, but a current of flying molecules—none the less capable of mechanical action because they are small almost past the possibility of conception.

The initial perplexity in thinking about the steam turbine lies no doubt in clearly seeing how pressure—potential energy, to use what is little better than scientific jargon—can disappear and turn up in another form as kinetic energy. But when we dive a little below the surface it will be seen that, according to received theory, pressure itself is nothing more than the result of the impact of flying molecules—in fact, the whole energy stored in any volume of steam or other gas is always essentially kinetic. To pursue this branch of the subject would, however, lead us away from the purpose which we had in view in writing this article. Many more patents will no doubt be taken out, but in so far as these refer to principle, and not to detail, the inventor will do well to keep the facts constantly in mind. The steam must be worked in such a way that while its molecules will always tend to move in right lines, they will give up their energy in the form of centrifugal effort, or recoil, according to the type of turbine in which they act. The ruling principle is always that we have a molecule, or a pound, or a ton, of steam, moving like a bullet at a velocity of 5,000 ft. per second, and we want to take all that motion out of it, transferring it to the rotating wheel. It is not, perhaps, easy at first to master the idea that steam can ever cease to be an elastic fluid exerting pressure in all directions; but once the facts are grasped, the whole theory of the action of the steam turbine becomes intelligible.

REPAIRING THE LUBRICATOR.

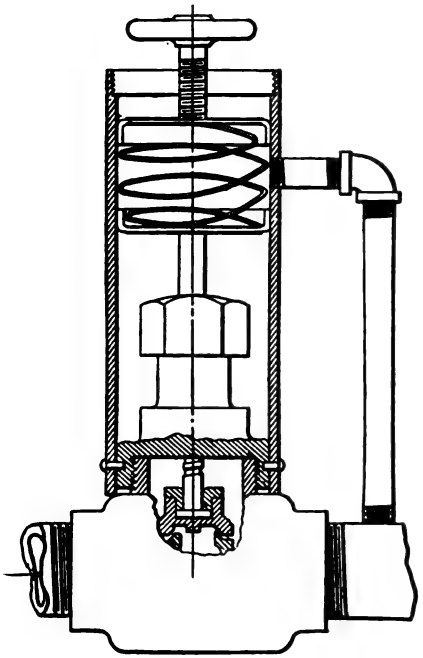
A lubricator which had frozen and cracked in two places and would not hold after having been fixed by the tinner a number of times was finally disposed of by a correspondent of the American Miller in the following manner:

A tin can, cut in half, just fitted the bulb or condenser. On top of this was poured babbitt. The arrangement, it is said, does not make a stylish appearance, but is O. K., and does not leak.

HOW TO MAKE A REDUCING VALVE.

To make the reducing valve shown here take a globe valve and file the stem so it will slide easily in the bonnet. File the base of the bonnet so a piece of brass pipe 6 in. long can be pinned on it. The body is thus formed, and it is now necessary for it to be steam-tight.

Fasten an iron washer on the valve stem-



Reducing Valve

top, and on top of the iron washer fasten a leather cup washer. Place a spring on top of this and on the spring place a piece of sheet metal for the adjusting screw to rest on. A valve wheel fastened on a piece of steel, as shown, will serve for this. Just above the cup-washer make a connection with the outlet of the valve and the body; this balances the pressure. A correspondent of Power says he has used such a valve on both steam and water with good results.

HOW TO MAKE BLUE OR ANTIQUE COPPER SCREWS.

Stand any bright screws on the heads on top of a stove; put a little oil on them; cover and heat until they are the color desired. The color will not rub off.—Contributed by C. J. Case, Troy, Pa.

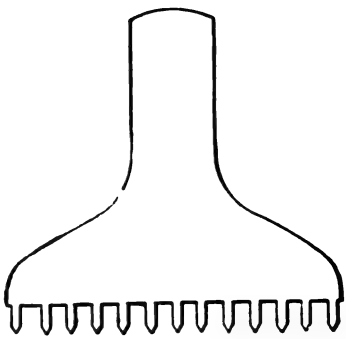
TO CLEAN MARBLE.

Mix up a quantity of the strongest soap-lees and quicklime to the consistency of milk; lay it on the stone for 24 hours; clean it and it will appear as new. To further improve, rub with fine putty powder and olive oil.

HOW TO COVER A BUGGY DASH.

For this job a tool made of a piece of plow steel and like the one shown in the sketch will be necessary. Lay the frame of the dash on the leather and mark along it with a lead pencil the places where the stitching is to be done. Allow 3-16 in. on the inside of the stitching for drawing, but none on the outside of the frame, where the marking should be exactly at the edge of the frame.

When through marking remove the frame, place the points of the tool on the pencil mark, and strike the two with a hammer, making 10 or 12 perforations at a time. In this manner go over all the pencil marks, placing an outside tooth of the tool in the last hole made each time the tool is lifted, as a guide.



Tool For Covering Dashboard

If both sides are to be covered with leather, says the Blacksmith and Wheelwright, tack the two pieces together before starting and punch both at the same time. If one side is of duck make holes in the duck with needles while stitching, drawing tightly all the while, and your dash will look like machine work, if the job has been carefully done.

ETCHING ON STEEL.

For etching names, dates or designs on steel use iodine, 2 parts; potassium iodide, 5 parts; water, 40 parts.

SHOP NOTES

USING MOTORCYCLES FOR SHOP POWER.

A motorcycle may be rigged up to run shop machinery with excellent results. The motorcycle will provide as much power as a 3-hp. gasoline engine and is not at all injured for use on the road by putting it to this purpose in the shop, says a correspondent of the American Blacksmith.

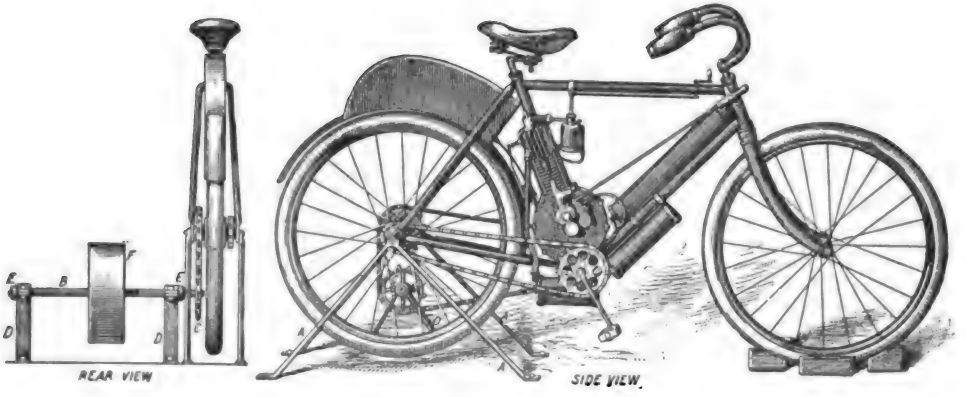
The arrangement is very simple. Make a stand, as shown in the sketch, to raise the wheel from the floor. Block the front wheel with a block on each side of the wheel, one in front and one at the rear. For the rear axle make a stand, A, and screw it fast to the floor. Make a small shaft, B, and fasten in the end of it a 20-tooth, ¼-in. sprocket, C. Have it flush. Make journals or bearings, D, to hold the shaft and use collars, E, to keep it in place. Set this directly under the large sprocket of the rear wheel of the motorcycle, fasten it there and get a chain long enough to reach all the way around. Make the pulley, F, 6x3 or 4x3, of whatever speed desired, and put in place. Set the machine upstairs or down, as desired, and run the belt from the spark shaft to the line shaft. Fill the bicycle tank, which holds 1 gal. of gasoline, sufficient for 100 miles' run at a cost of about 14 cents. It is not necessary to keep gasoline in storage as when riding to and from the shop one may have the tank filled at a store. The bicycle can be taken from its stand for use on the road in five minutes.

This arrangement is suitable for running a drill press, horse clipper, grindstone, lathe or emery wheel.

Dwelling houses of hollow concrete blocks have been constructed by the San Pedro, Los Angeles & Salt Lake R. R. for some of its section foremen. Each house is provided with a concrete cistern.

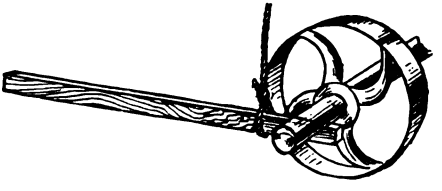
REMOVING OLD GEAR WHEELS FROM SHAFTS.

Gear wheels which have been on the shaft a long while so that they are in a decaying condition may be removed by means of a ram rigged up as shown in the sketch.



Using a Motorcycle for Shop Power

Five-foot gear wheels with 9-in. hubs which had been on a 6-in. shaft for 12 years were removed in this way by C. J. Case of Troy, Pa. An old shaft, 4½ in. in diameter and 6 ft. long was hung from the ceiling by means of a rope. This served as the ram and was propelled by four men. The wheels came off readily.



Removing Old Gear Wheels

COMPASSES FOR METAL WORK.

The compass shown at Fig. 1 can be made by most any one out of sheet material. The compass has no locking device, as it depends on the tightness of the point to keep it in

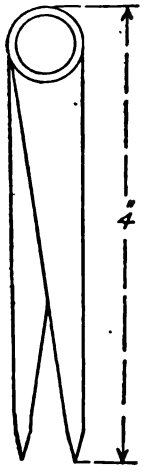


Fig. 1

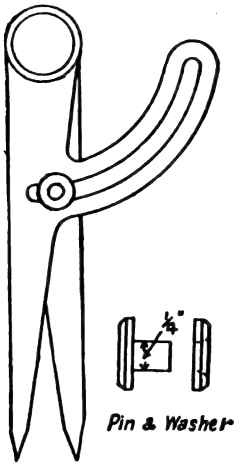


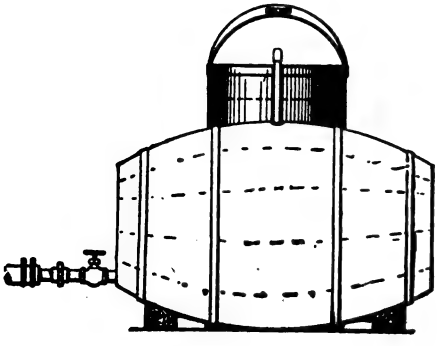
Fig. 2

position when in use. Use thicker material than is used for calipers, says the Model Engineer, London, and harden and temper the points. Fig. 2 shows another useful form of compass which is not difficult to make.

AN EASY WAY TO EMPTY AN OIL BARREL.

For emptying oil from the barrel into the oil tank, the arrangement shown in the sketch is highly recommended by a correspondent of the Engineers' Review. The device is operated by air pressure.

A short piece of 2-in. pipe is fitted to a valve, and a nipple having the female side of a coupling screwed to it, is fitted into the valve. A rubber hose is connected with a piece having the male part of the coupling screwed on it and this pipe is connected to the air line. In the bung hole on the side of the barrel a pipe, proportioned so that it reaches up above the top of the tank and extends over so as to empty in through the round hole that is in the top of most tanks, is fitted.



Emptying an Oil Barrel

When ready to empty a barrel of oil, it is rolled near the tank, stood on end and a hole to receive the 2-in pipe having the valve is bored in it, the pipe is screwed in and the valve closed tight. The barrel is then tipped down, the plug in the side removed, and the pipe which runs up the side of the tank is screwed in. This should fit tightly so there will be no leaking. The air is then turned on, the pressure forces the oil up into the tank and the barrel is emptied in a short time.

It might be possible to work this scheme with water pressure, but unless there were some efficient means of draining the bottom of the tank, the little water that would be apt to collect there would cause the tank to rust.

AGING OAK WITH AMMONIA FUMES.

Strong ammonia fumes may be used for aging oak says the Manual Training Magazine. Place the piece to be fumed, with an evaporating dish containing concentrated ammonia, in a box and close it airtight. Leave for 12 hours and finish with a wax polish, applying first a thin coat of paraffine oil and then rubbing with a pomade of prepared wax made as follows: Two ounces each of yellow and white beeswax heated over a slow fire in a clean vessel (agate ware is good) until melted. Add 4 oz. turpentine and stir till entirely cool. Keep the turpentine away from the fire. This will give the oak a lustrous brown color, and nicking will not expose a different surface, as the ammonia fumes penetrate to a considerable depth.

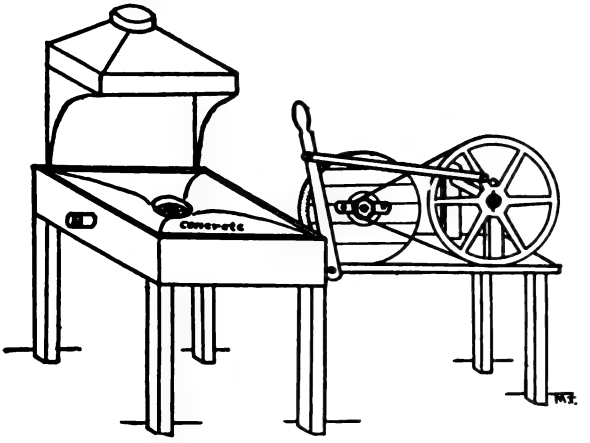
PREPARING BORAX FOR USE IN WELDING STEEL.

Put 1 lb. of borax in an old iron kettle and set it over the forge fire and cook it thoroughly. Keep stirring slowly after the borax is all melted and until it resembles popcorn. There will be about three times the original quantity, and it will go farther and do its work better.—Contributed by Wm. Raymond, New Sharon, Iowa.

HOW TO MAKE A SUBSTANTIAL FORGE.

The farmer or other person in a remote place who wishes to become his own blacksmith can make a cheap and substantial forge in one day, after the following method:

Make a square box of 8-in. board, 2 ft.



A Home-Made Forge

on the sides, and place legs of convenient length inside the corners. Nail a solid floor on the bottom of the box. In a 2-in. iron pipe, 30 in. long, drill about a dozen ¼-in. holes in a small circle near the center. Pass the pipe through snug holes cut in two opposite sides of the box, leaving it protrude 2 in. on either side. If one end of the pipe is threaded, screw it into fan before running through the box.

Make concrete of Portland cement, one part, sand three parts, and mix with enough water to make it of the right consistency. Tamp the concrete into the box above and below the pipe, leaving the top sloping toward the holes in the pipe. Put a heavy 4-in. ring around the holes and cement it in. A plug in the outer end of the pipe allows ashes to be blown out when necessary.

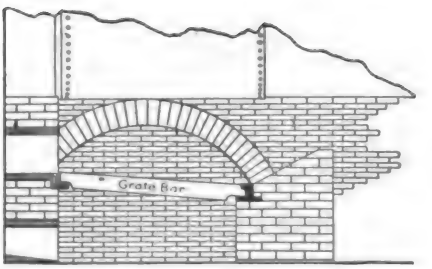
The fan should be about 6 in. wide and 18 in. in diameter, with iron or hard maple boxes and a 2-in. pulley. Mount the fan on the same board that forms the bottom of the forge box, for rigidity. A hood may be suspended over the hearth and connected to the forge back by a strip of sheet iron. When the cement has hardened, a durable fireproof forge is the result. A welding heat can be obtained in one minute with this outfit.—Contributed by Muron Tombaugh, Streator, Ill.

A GERMAN METHOD OF CLEANING MACHINERY.

The use of blotting paper for cleaning machinery in many of the large shops in Germany has been found very effective and economical. The German workman formerly used on an average 250 grams of cotton waste, one new sponging cloth and one or two renovated ones per week; now he is supplied with 150 grams of cotton waste and eight to ten sheets of blotting paper, at a cost of two and a half cents, instead of six and a quarter cents, as formerly. The paper is, therefore, not only cheaper, but does not soil the engine with fiber and dust, like sponge cloth and woolen waste, which was used, besides being otherwise preferable even to cotton waste. It has the advantage of being less combustible than other cleaning materials, and safer in another way; by eliminating the chances of having the hand drawn into moving machinery while in process of cleaning.

ARCH IN SIDE WALLS OF FURNACE.

The constant repairing of side walls of the furnace of externally fired boilers is a big item of expense. An arch in the side wall, spanning the entire length of the grates, will save the cost of its installation many times in a year, says a correspondent

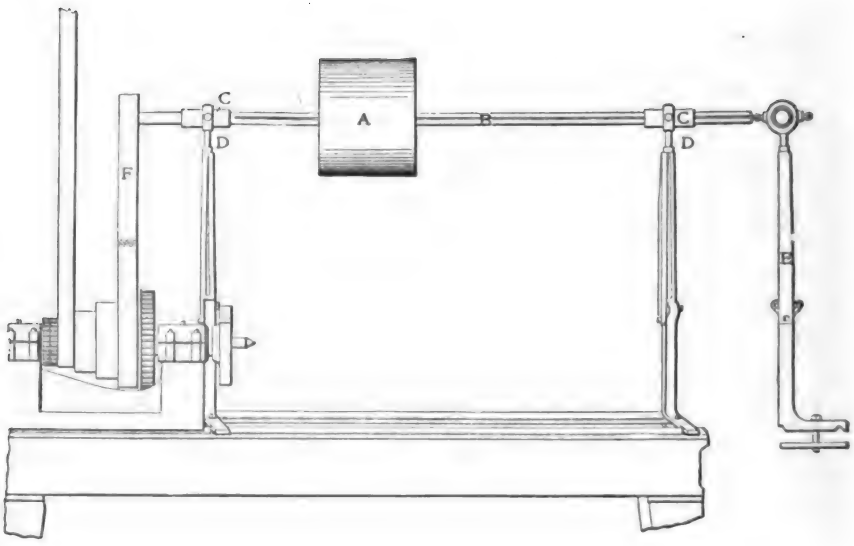


Arch in Side Walls of Furnace

of the National Engineer. When the fire brick are burnt out and must be replaced, only the brick beneath the arch need be removed, and the upper part need not be interfered with. Each engineer must determine the height of the arch required in his individual case.

GRINDING ATTACHMENT FOR A LATHE.

A grinding attachment, intended for short work and internal grinding, which does away with an overhead drum with belt and hangers and which can be put on and taken off a lathe in a few moments is described by a correspondent of the American Machinist.



Grinding Attachment for a Lathe

The shaft, B, has a spline, so that the drum, A, which is provided with set screws to fasten it, can be slid to any position over the lathe bed. The shaft boxes, C, are self-adjusting and can be raised to take up the slack of the belt, F, and then secured by the collars, D. The upper portion of the stanchion, E, is hinged so that the shaft and drum may be swung to conform to the different angles in which the grinder is used, and thereby causes a flat belt to run better on the driving pulley of the grinder. Silk ribbon is used for high-speed belts, Any simple form of grinder can be fastened to the tool block of the lathe and belted to the drum, A. The stanchions are fitted to the slides of the lathe and held by a bolt that screws into a flat piece placed under the inside projections of the lathe bed.

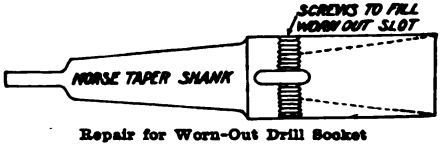
The belt, F, must be connected so it can be readily put together or taken apart. A steel belt hook fastened to one end of the belt may be used successfully with holes punched in the other end, so that the hooks when slightly bent will enter and stay as well as when clinched.

HOW TO MAKE TRACING PAPER.

Tracing paper for use with either pen or ink may be made by brushing a solution, consisting of one part of castor oil in two parts of methylated spirits (poisonous), over one side of some good thin printing paper. Blot off and hang up to dry, after which it is ready for use.

REPAIRING A WORN-OUT DRILL SOCKET.

There is an old and easy method of repairing a worn-out drill socket which may not be known to some, and which will be found of particular benefit in repairing morse taper shanks, which in time become



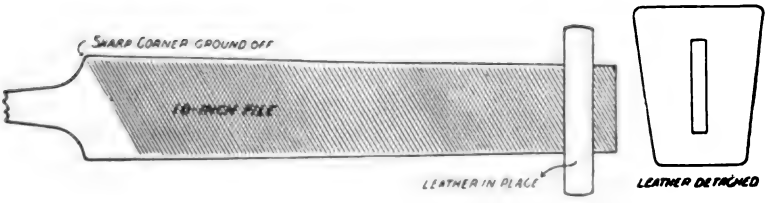
Repair for Worn-Out Drill Socket

worn so that the tang will no longer hold. By drilling out and tapping at the bottom of the slot a piece may be screwed in and squared out again, thus making the socket as good as new. By drilling from each side and tapping, a plug may be made a very tight fit, thus avoiding any chance of working loose.—Contributed by A. C. Eggleston.

SUBSTITUTE FOR A SWAGE-SHAPER.

A filer who had some full-swage gang edger saws to fit, but had no swage-shaper, used a side file instead and put the same bevel on each tooth in a manner which was both ingenious and efficient.

In a small piece of leather belting, nearly ¼ in. thick, he cut a slot so that it could be slipped over the end of a 10-in. file. He held the file on an emery wheel and ground off the sharp corners so they would not scratch the saw. Then by resting the leather on the saw plate, it gave him a bevel back from the face of the tooth and also from the extreme cutting edge towards the eye of the saw. This gave a tooth with the cutting edge the widest. By the aid of a gage he filed until the swage just touched the gage and so made all teeth the same spread. The saws so made worked nicely and cut smoothly, says a correspondent of the Wood-Worker, but the method is recommended only for emergencies when a swage-shaper cannot be had.



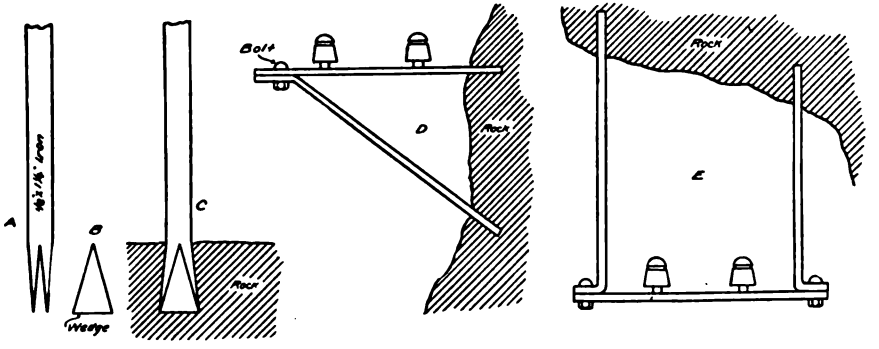
Swage-Shaper Substitute

In a new clock for a sick room, an electric lamp is arranged behind the dial, and when the invalid presses a button, the shadow of the hours and hands, greatly magnified, is thrown on the ceiling where he can see it without turning his head.

A GOOD METHOD FOR ATTACHING LINE WIRES TO ROCK.

Telephone lines must often pass in a circuitous and lengthy route in mountainous countries, because of no convenient means of attaching wires to rock. A correspondent of the American Telephone Journal describes a good rock fixture for this purpose.

A piece of strap iron, ⅛ in. by 1¼ in. and tapered slightly at one end is split in the center of the tapered end as shown at A in the drawing. A hole 4 in. deep is then drilled in the rock, and a wedge, like B in the sketch (previously made), is placed in the split end of the iron rod and the rod is then driven into the hole drilled in the rock, as at C. It is practically impossible to withdraw a rod put in in this way as the two fingers of the rod spread apart as it is driven against the wedge, and the effect of an expansion bolt is produced.



Fixture for Rock

The sketch shows this scheme applied to a vertical rock at D, the two rods or straps being bolted together, and applied to the under side of a rocky ledge at E. In each case, the insulators are screwed to steel pins, which are screwed to the iron straps.

A hot pin may be cooled by pouring a half teaspoonful of aqua ammonia in the oil cup with the oil.

HOW TO MAKE A FOUR-EYE MAST BAND.

On all ship yards and masts and on derricks, also, bands having a number of eyes are used, the number being determined by the circumference of the mast. The purpose of the band is to strengthen the mast

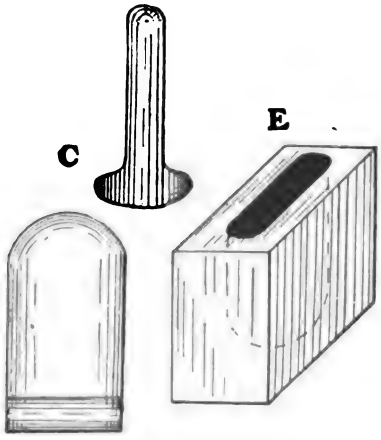


Fig. 1—Jump and Stamp Block

and to equalize the strain on it when lifting weights. On one eye (on a boat the eye pointing toward the bow) is hung the boom or spar for lifting the weights, and to each of the others is fastened a wire stay so that each pulls against the other and causes a down pressure instead of a side pressure, says the American Blacksmith.

To make such a band having four eyes, first determine what the circumference of the band should be. Suppose the mast is 16 in. diameter and the iron for the band 4 in. wide and 1½ in. thick. To the 16 in. (diameter) add 1½ in.' (thickness of iron) which gives 17½. Multiplying this by 3 1-7 gives 55 in. as the required circumference. This divided by the number of eyes to be used (4) gives 13¾ in. as the distance from center to center of jumps.

Mark the center in a bar of iron 60 in. long, as at H, Fig. 2, and measure half the distance there is to be between jumps, or 6⅞ in., at one side of the center, and upset well as at A, Fig. 2. Drive the fuller down into this upset portion well, and by splitting with a hot chisel and fullering with a sharp fuller, gradually shape as shown at B. Measure for each jump from the first one made and make the other three in the same way.

Have ready the four jumps as shown at C, Fig. 1. Heat one of the jumps and a portion of the bar into which it is to go to a good red heat, set the bar on its edge and drive the jump into place. Hammer and scarf down well as at D, Fig. 2. Place in the fire, put a thin shell over it, and slowly heat, being careful not to burn it. When it is hot, put it in the stamp block, E, Fig. 1, and drive down well. Knock the stamp block off, finish the edges and chamfer between Y and Z. Put a jump on at P, Z and X.

The band should be first bent at each jump, as at F, so the jump will not tear it when bending to a circle. Measure off the circumference as at G and I, Fig. 2, add the thickness of the iron for welding and bend and weld. To work the eyes in the

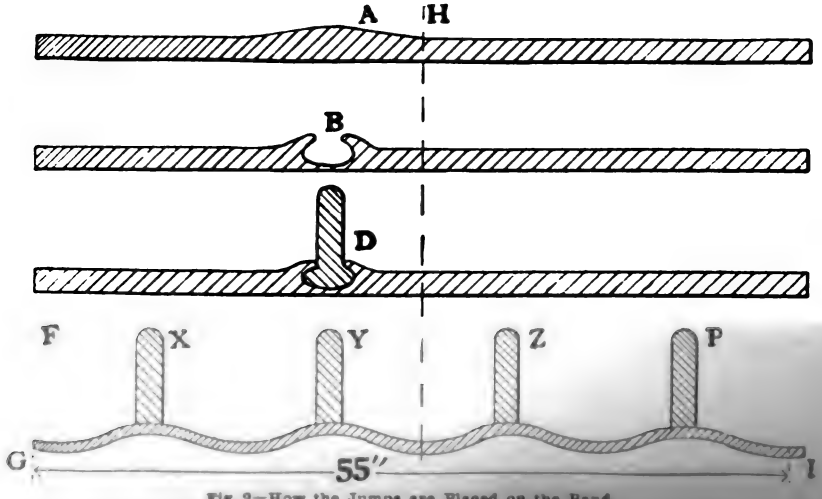
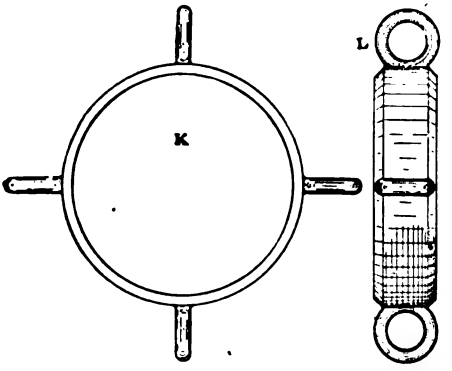


Fig. 2—How the Jumps are Placed on the Band

jumps, use a round punch, flattened at the point, which will swell out in the iron when punching. Round the eyes with an eye-bolt fuller and swage. The finished band is shown at K and L, Fig. 3.



Top and Side Views of Finished Mast Band

This makes a neat solid job, with jumps that will not tear out or loosen either while bending the band or punching the eyes in them.

HOW TO LETTER ON TIN.

Draw the letters and ornaments upon a smooth, thin piece of light brown paper, one-half inch larger than the sign, using a lead pencil and making the characters neatly and precisely. Rub whiting over the back of the paper, a neat coating, and place the whiting side directly upon the face of the tin. Remove both to a drawing table and tack firmly in place through the margin of paper. Go over all the letters, etc., with a tracer, or other sharp point; this will leave a white line on the tin, so transferring the pattern, and it is then ready for laying gold size, or for finishing in any other way desired. When all is through, says the Master Painter, rub off accidental spots of tracing with a pad of cotton.

HOW TO REMOVE FILM FROM A SPOILED NEGATIVE.

Hold the plate over a pan of boiling water for a few seconds, being very careful not to melt the film, until the film slips by the pressure of the thumb. It if fails to come easily, hold again over the steam. This is the simplest method, says the Photo-Beacon.

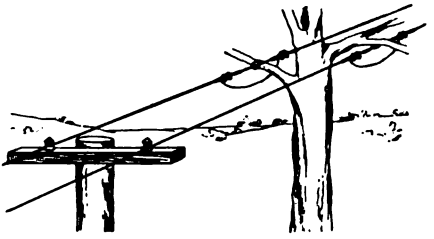
INSULATING WIRES FROM TREES.

The following method of insulating wires from trees comes highly recommended from one who has had considerable experience in line work.

To each end of a piece of No. 6 gauge, hard-drawn wire, 3 or 4 ft. long fasten a glass insulator, first knocking the end of the insulator out with a piece of iron so that there is a hole clear through. For a 1,000-volt-current use but one insulator on each end of this wire, but where for 2,000 volts use insulators on each end. Twist the wires on the insulators securely.

Fasten this wire to the limb or any part of the tree affected by the line wire by means of a loop of greasy leather nailed to the limb and large enough for the wire to pass through freely.

Put the line wire through the groove of the insulator on one end of the still wire, loop it loosely across under the limb so



Insulating Wires from Trees

that it touches no part of the tree, and fasten it at the other side to the insulator on the other end of the still wire.

This affords excellent insulation in wet weather and is just as safe then as any other part of a good line.—Contributed by W. J. Catlin, Glen Ellyn, Ill.

A GOOD BROWN FOR VEHICLES.

A good brown color for vehicles is obtained by using Indian red and black for the first coat, and black rubbing varnish charged with vermilion for the second. Burnt umber and burnt sienna in proportions to taste will give a warmer brown. Add a little white if too dark, or burnt and raw umber in equal parts. Make the first coat flat, and the second color-and-varnish. —From John L. Whiting & Son's book, "What Else to Do."

ABUSE OF TWIST DRILLS.

Before proceeding with this article I wish to state that I look at all things from a proprietor's point of view. Therefore, I want to tell just how our drill case appeared to me. I believe I am safe in saying that twist drills receive more abuse than any tool about the shop, and when a man is compelled to buy them he is interested in the care they receive. They are run at all speeds, and in case of a hurry-up job, I have seen the fire fly. The pressure applied to them varies according to the strength in the operator's arms, which covers a wide range, from 50 lbs. up to and including a ton, or whatever he is capable

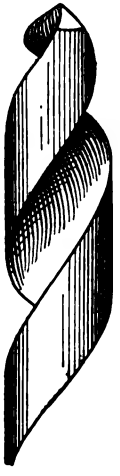


Fig. 1.

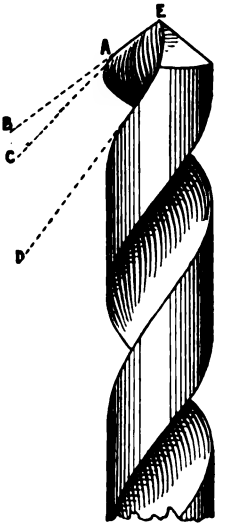


Fig. 2.

of pulling on a lever and twisting on a hand wheel.

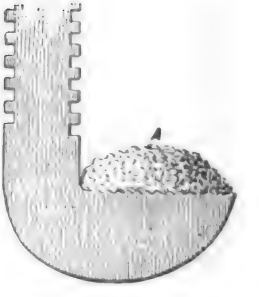
Judging from the looks of our drill case, they have been used as punches, but they did not give as good service as the boiler punches did. The point of the drill looked like Fig. 1. Worn off to about one-half size, the cause being too high speed. If one of the boys becomes a little excited, he immediately declares war against the small tools. The twist drill, of course, bears the brunt of the attack. The weapon used is an emery wheel, which is very destructive to the drill when the boys get excited. As I viewed our drill case I thought of the old story of John and the pants which he brought home on Saturday evening to wear the following Sunday morning. Finding them 2 in. too long, he instructed his mother to cut off 2 in. Fearing she would forget, he instructed his sister, also fearing that she, too, might forget, he instructed his grandmother likewise. It so happened that the mother, sister and grandmother had good memories. And they each cut off 2 in. John's pants reached the high water mark the following Sunday morning. So it is with the twist drill. Frank uses a drill and wears the outer points of the cutting edge off in a rounding shape (A, Fig. 2); Bill grinds the rounding points off without grinding the point (E, Fig. 2); making the angle that of B; Bill also wears the outer points off; Frank again grinds after Bill without grinding the point, E, making the angle that of C. This is repeated, each grinding after the other the dull outer edge without grinding the point, until the angle, D, is reached. At this stage the honor of being a first-class countersink is bestowed upon the drill. The angle, like John's pants, has reached high water mark.—Paul S. Baker, Muscatine, Iowa.

WINE COLOR FOR VEHICLES.

A good "wine color" paint for vehicles is made by adding a little vermilion to carriage part lake. Use a standard grade, and one coat of this and a coat of color-and-varnish will cover without any ground.—John L. Whiting & Sons' Book, "What Else to Do."

HOW TO HARDEN A STILLSON WRENCH.

The easiest method of hardening a Stillson wrench is to take the jaws out, anneal them and file them sharp. Then heat the



jaws red and lay some nitrate of potash on the jaws and teeth as at A in the sketch and plunge into water. A correspondent of the Blacksmith and Wheelwright says he has had jaws tempered in this way for years, and has never experienced difficulty in getting the right temper.

TO PROTECT A MOTOR FROM DUST.

To protect a motor from dust, which is sure to be present even where a fan system is used for carrying it away, a galvanized iron cover, A, Fig. 1, made to fit the

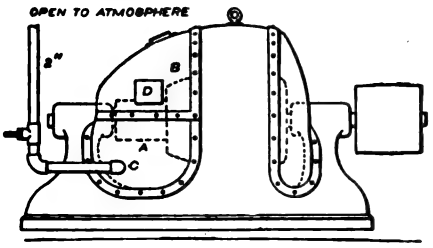


Fig. 1

motor frame snugly and fastened rigidly to the frame, is satisfactory, says a correspondent of the Engineer. Access to the commutator and brushes is afforded by a hinged cover, B, and sparking may be detected, without opening the casing, through a peek-hole, D, about 4 in. square and covered with mica.

A jet of air, supplied by the siphon or jet blower shown in Fig. 2, and which is operated by compressed air, is kept blow-

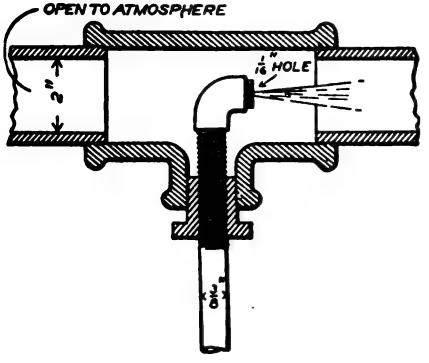


Fig. 2

ing in at C, and the air forces its way out through the openings and cracks at the top and sides of the machine. This jet of air allows no dust or grit to settle upon the motor and keeps the machine cool, also.

The color of common mahogany may be improved by applying a solution of potassium hydrate, or lye, to the surface. To determine the required strength of the solution test on a piece of waste stock of the same kind before applying. Fill with a dark paste wood-filler, varnish and polish with shellac.

READY REFERENCE METRIC CONVERSION TABLE.

C. H. Nicolet, of La Salle, Ill., sends to Engineering News the table which we print below, and regarding which he says:

I send herewith an excellent little conversion table which has had a place in my pocket note-book for many years, and has proven very useful. It is sent to you with the belief that it may be appreciated by other engineers. The arrangement of the

Millimeters	×	.03937	=	Inches.
"	=	25.400	×	"
Meters	×	3.2809	=	Feet.
"	=	.3048	×	"
Kilometers	×	.621377	=	Miles.
"	=	1.6093	×	"
Square centimeters	×	.15500	=	Square inches.
"	=	6.4515	×	"
Square meters	×	10.76410	=	Square feet.
"	=	.09290	×	"
Square kilometers	×	247.1098	=	Acres.
"	=	.00405	×	"
Hectares	×	2.471	=	"
"	=	.4047	×	"
Cubic centimeters	×	.061025	=	Cubic inches.
"	=	16.3866	×	"
Cubic meters	×	35.3156	=	Cubic feet.
"	=	.02832	×	"
"	×	1.308	=	Cubic yards.
"	=	.765	×	"
Liters	×	61.023	=	Cubic inches.
"	=	.01639	×	"
"	×	.26418	=	U. S. gallons.
"	=	3.7854	×	"
Grams	×	15.4324	=	Grains.
"	=	.0648	×	"
"	×	.03527	=	Ounces, av'dupois
"	=	28.3495	×	"
Kilograms	×	2.2046	=	Pounds.
"	=	.4536	×	"
Kilog's per sq. centimeter	×	14.2231	=	Lbs. per sq. inch
"	×	.0703	×	"
Kilogram per cubic meter	×	.06243	=	Lbs. per cubic foot
"	=	16.01890	×	"
Metric tons (1,000 kilog's)	×	1.1023	=	Tons (2,000 lbs.)
"	=	.9072	×	"
Kilowatts	×	1.3405	=	Horse-powers.
"	=	.746	×	"
Calories	×	3.9683	=	B. T. units.
"	=	.2520	×	"
Francs	×	.193	=	Dollars.
"	=	5.18	×	"

table is especially commendable, as the entire conversion process is at once apparent, thus:

M = (millimeters) × .03937 = I (inches) or, reversing,

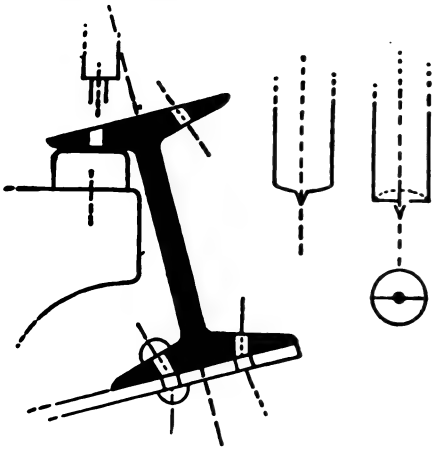
I (inches) × 25.4 = M (millimeters).

TO PROTECT LABELS ON BOTTLES.

To protect labels on bottles so that they will adhere for years and not be affected by acids or dampness first give them a coating of size, and then a coating of gelatine, prepared by swelling a little cooking gelatine in cold water and making it fluid by placing the vessel containing it in a dish of nearly boiling water. Allow the gelatine coating to dry and then apply a single coat of "church" or "oak" varnish which will dry in a few hours, and affords better protection to the labels than other quick-drying varnishes. The Photo-Beacon says that the labels on bottles in chemical laboratories are protected in this way.

PUNCHING STRUCTURAL STEEL FOR LOCOMOTIVE TENDERS.

Structural steel shapes, chiefly channels and I-beams, are used in the construction of locomotive tenders, and many methods are used in the various shops for punching these rolled shapes, says Railway and Locomotive Engineering. Most of these



Punching I-Beams

methods are very difficult of execution as an attempt is made to do the punching so that the axes of the holes shall be parallel with the web of the rolled sections.

In one railway shop a much simpler method of punching without reference to the parallel idea, so far as the axes of the holes is concerned, is used. The bevel side of the flange is laid flat on the die and the descending punch encounters the upper surface of the flange at an angle. This method of punching causes the holes to be as they appear in the illustration. A reamer, when run through before rivets are applied, somewhat modifies the angle at which the hole is punched, but the rivets when driven are not straight; the important point, however, is that the holes of the I-beam and the plate are absolutely in register, and as the rivet is made to fill both holes, and as there is no vestige of a shoulder at the point of union, the bending of the axis of the rivet is not thought important. In fact, a certain advantage is claimed for it, and that is that the bent rivet lessens the strain on the rivet heads, and the punching can be done without any specially constructed supports or apparatus for holding the steel I-beam or channel in place. A shearing punch is not necessary, but the face of the punch should be flat or slightly hollow, and not rounded.

TO MAKE CASEIN COLD WATER PAINT.

Either of the following formulae for making casein cold water paint is recommended by the Master Painter:

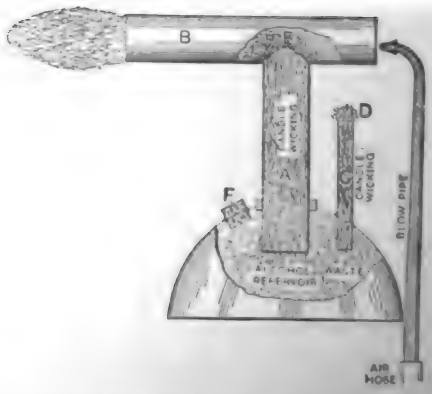
For interior use—10 lb. pure casein, 1½ lb. soda ash, 58 per cent; 88½ lb. plaster of paris or whiting.

For exterior use—9 lb. pure casein, 4 lb. pulverized air-slaked line, ¾ lb. silica, 86¼ lb. plaster paris or whiting.

HOW TO MAKE AN ALCOHOL BURNER.

An alcohol burner which is much safer than a gasoline torch for soldering and other purposes may be made at home. The one shown here was devised by a correspondent of Machinery, who says, that while the flame cannot be focused to a small point, the burner is very handy for drawing the temper in broken taps.

To make the burner take the bottom of an oil can, stuff it full of waste, and solder in the brass tubes, A and C. Draw candle-wicking through these tubes, as shown. At the top end of tube, A, fit another tube, B, and drive A into an opening at E. Have a hole at F, plugged with a cork, for refilling. Solder a blowpipe into permanent position, the small end being nearly central to the open end to tube, B, serves also as a handle to hold the burner.



Home-Made Alcohol Burner

To start this torch, light the wicking in tube C, which will heat tube B. The alcohol gathered at E will form a gas immediately; the gas ignites and comes out of both ends of B, when the air is forced into and through the blowpipe the flame will come

from the opposite end of the blowpipe. The flame is very green in color and somewhat better than the flame from a gasoline torch.

THREADING AN ELL.

In removing an old hot water tank having 1½-in. connections and replacing it with a larger tank having 2-in. connections, a correspondent of the Metal Worker, who had no fittings of any kind larger than 1½-in. on hand, but had a 2-in. die and stock and vise made good connection by threading an

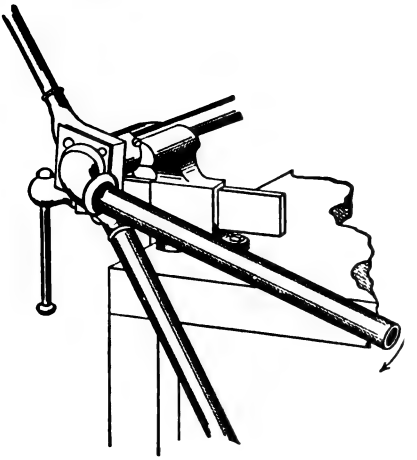


Fig. 1. Method of Threading An Ell

ell. To apply this kink under similar conditions, proceed as follows:

Start a 1½-in. beaded malleable iron ell on one end of a piece of pipe about two or three threads. Take the faceplate out of the stock and put in the 2-in. die, reversed from the ordinary position. Slip the pipe through the dies and guide until the ell strikes the die. Then grip the pipe tightly in the vise, close to the guide; put a piece of pipe over the handle of the stock, so as to reach to the floor and prevent the stock from turning. Into the other end of the beaded ell screw a piece of 1½-in. pipe 2 or 3 ft. long. Then everything is ready to start the work and in a very few minutes a 2 x 1½ in. street ell can be produced, as the operation will thread the bead on the outside of the ell.

Fig. 1 shows the method of working. The screwing up of the ell on the threaded pipe feeds or forces it into the 2-in. die and results in a thread being cut on the outside of the bear, so that it can be screwed into any 2-in. fitting. Another advantage that this manufactured ell has when it is completed is that it is threaded on the inside so as to receive the delivery tube or pipe, as shown in Fig. 2, to conduct the cold water to the bottom of the boiler.

The table below shows what sizes of pipe

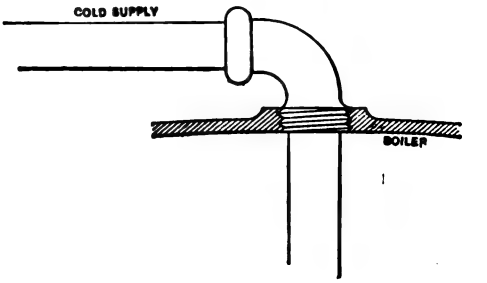


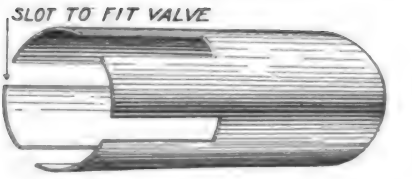
Fig. 2. Ell Threaded on Outside

for different fittings now on the market can be threaded:

1½-inch beaded fitting can be threaded to fit 2-inch pipe.
1¼-inch not adapted for any standard size.
1-inch plain fitting can be threaded to fit 1¼-inch pipe.
¾-inch plain fitting can be threaded to fit 1-inch pipe.
½-inch plain fitting can be threaded to fit ¾-inch pipe.
⅜-inch plain fitting can be threaded to fit ½-inch pipe.
¼-inch plain fitting can be threaded to fit ⅜-inch pipe.

WRENCH FOR REMOVING VALVES FROM PUMPS.

Any size pipe can be used as a wrench for this purpose by taking a hack saw and sawing slots in it to fit the bridging on the pump valve. Such a wrench is easily made



Novel Wrench

with but few tools. Valves that have been in pumps for years I have removed in this way with a 3-in. pipe.—Contributed by W. J. Catlin, Superintendent Electric Light and Water Works, Glen Ellyn, Ill.

For lubricating journals, a compound consisting of one part fine plumbago and eight parts Albany grease is good.

All the articles appearing in this department are reprinted in book form at the end of the year. Price 50 cents postpaid.

TABLE OF KILOWATT-HOUR COSTS.

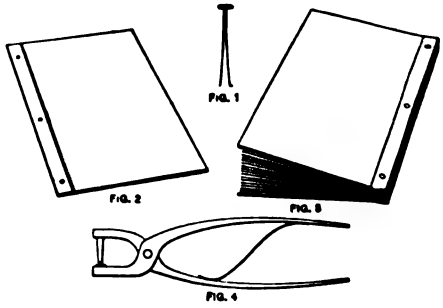
It is frequently necessary to reduce kilowatt costs per year to kilowatt-hour costs, or vice versa, and to do so entails calculations that though simple are irksome, says a correspondent in Journal of Electricity, Power and Gas. Such costs, of course, depend upon the hours of daily service rendered, and in ascertaining them it has been found convenient to reduce them to a tabulated form for ready reference, when they appear as follows for daily services amounting to ten, twenty-one and twenty-four hours respectively:

Cost Per Kilowatt-Hour	Cost Per Kilowatt-Year—Hours Per Day.		
	10	21	24
$0.015	$54.75	$114.97	$131.40
0.0145	52.92	111.14	127.02
0.014	51.10	107.31	122.64
0.0135	49.28	103.48	118.26
0.013	47.45	99.64	113.88
0.0125	45.62	95.81	109.05
0.012	43.80	91 98	105.12
0 0115	41.98	84.15	100.74
0.011	40.15	81.13	96.36
0.0105	38.33	80.48	91.78
0.010	36.50	76.65	87.40
0.0095	34.68	72.82	83.22
0.009	32.85	68.98	78.84
0.0085	31 02	65 15	74.46
0.008	28.20	61.32	70.08
0.0075	27.37	57.49	65.70
0.007	25.55	53.65	61.32
0.0065	23.72	49.82	56.49
0.006	21.90	45.99	52 94
0.0055	20.07	42,16	48.18
0.005	18.25	38.32	43.80
0.0045	16.42	34.47	39.42
0.004	14.60	30.66	35.04
0.0035	12.77	26.83	30.66
0.003	10.95	22.99	26.28
0.0025	9.12	19.16	21.90
0.002	7.30	15.33	17.52
0.0015	5 47	11.50	13.14
0.001	3.65	7.66	8.76
0.0005	1 82	3 82	4.38

SIMPLE METHOD OF PRESERVING ARTICLES FOR REFERENCE.

Articles, pamphlets and old catalogs which one may desire to keep for reference may be preserved in convenient form in the following manner:

Select an old out-of-date catalog of good size and having board covers. Strip the covers from the contents and cut off the flexible back up to the point where the stiff boards are glued to it. About ¾ in. from the back edge of the cover and from the inside cut the board cover nearly through lengthwise, as in Fig. 2, so that the back may be broken. This cut line may be made to act as a hinge by bending the cover over a straight table edge, the flexible binding holding the parts of broken board together. Put in such papers as it is desired to preserve, with brass pamphlet pins (Fig. 1), running the pins through the loose pages and the hinge pieces, Fig. 3. The pamphlet pins



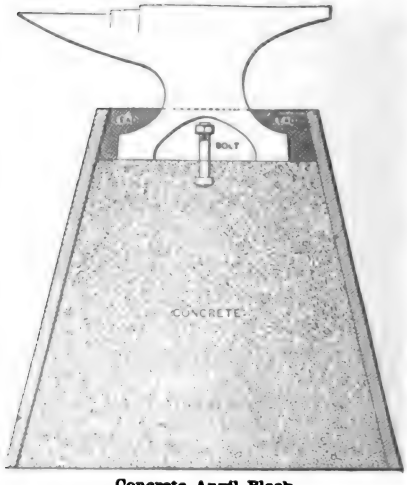
Preserving Articles for Reference

cost about 20 cents per 100. Smooth holes may be made through the pamphlet and binder by the use of a belt punch like the one shown at Fig. 4, says the Metal Worker; this tool costs about 20 cents. If wished an index sheet may be bound in with papers, and the covers of the book may be labeled.

CONCRETE ANVIL BLOCKS.

The difficulty of holding the anvil secure on the block is solved by the use of a concrete block, such as that shown in the illustration.

To make such a block, encase concrete, made of crushed stone and cement, in a rectangular box made of ⅜-in. cast iron, 18 in. high and having a base 14x18 in. tapering to 8x10 in. at the top. The inside measurement at the top should be just 1 in. larger than the base of the anvil, which rests on the concrete 2 in. below the top



Concrete Anvil Block

of the casting. On each side of the anvil (front and back) embed a bolt and nut in the concrete to a depth of 3 in., allowing the nut to project upward nearly to the top of the casting and about 1 in. above the concrete. Pour melted lead on top of the concrete, until the space (2 in. deep) between the base of the anvil and the top of the casting is filled. The nut of the bolt and the taper of the casting will hold the lead to the cement.

The cost of mounting anvils in this way is very little, says a correspondent of Machinery, and the noise and vibrations when the anvil is struck are done away with. It takes the poetry out of the ringing blows of the blacksmith's hammer, but will be found a most convenient arrangement, especially for colleges.

HOW TO MAKE A SMALL STORAGE BATTERY.

Procure an old battery jar about 6 in. high by 4 in. in diameter, and a piece of sheet lead 3 ft. long and 7 in. wide. The lead may be obtained at any hardware store or plumber's. Cut the lead exactly in half, making two pieces 18 in. long and 7 in. wide. Remove a strip 1 in. wide and 17 in. long from each of the plates, leaving them 6 in. wide, with a lug at one end for connections. Cut an old piece of cord or rope ¼ in. in diameter, into four pieces, each 18 in. long. This is for insulating the plates from each other when ready to charge.

Lay two lengths of the rope across one of the plates, about 4 in. apart, and place the other plate upon the two cords, with the two remaining cords laid upon the second plate. Be careful to have the two lugs on the same side and at opposite ends.

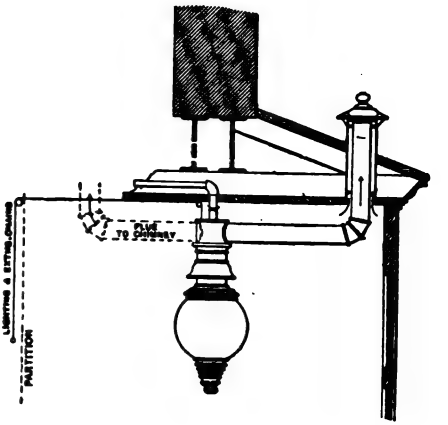
Get a piece of an old broomstick, and carefully wind the whole on the stick, making sure that at no point the lead plates come in contact with each other; otherwise, the battery will be short-circuited and will not receive a charge. It will be found that the coil fits into the jar neatly. The next step is to prepare the acidulated water, which can be easily done by mixing 1 oz. of sulphuric acid with about 10 oz. of water. This is the right proportion, but about twice that amount must be used to fill the jar with two lead plates in it.

The battery is now ready to charge. Either post may be marked plus, but they must not be changed after they have once been charged. The first time the battery will lose its charge rapidly, but the second or third time it is charged it will retain a current for quite a long time. Two or three of these batteries will light a small 2-candlepower electric lamp, or will run a large motor.—Contributed by E. H. Klipstein, East Orange, New Jersey.

HOW TO PREVENT MOISTURE IN SHOW WINDOWS.

The device shown in the illustration is for securing ventilation in windows lighted by gas in a way that prevents moisture in the windows, says the Acetylene Journal.

A simple 6-in. galvanized iron conductor pipe is fitted tightly over the top of the



For Preventing Moisture in Show Windows

lamp and extends upward and outward into the open air, and carries off the products of combustion. If more convenient, the pipe may connect with a chimney instead of passing through the roof. The lamp is turned off and on by means of chains extending over pulleys to any convenient point. The lamp may be placed close to the ceiling so that it will not hang down in an unsightly position, and it is said that trouble from either frost or moisture is entirely obviated by this means.

Holes as smooth as glass may be obtained in long cast-iron tubes of large diameter, as 15-in. for instance, if kerosene is used as a lubricant and, for boring, a "packed bit," such as is used for gun-boring.

Only lead lined tanks with seams burned together instead of soldered should be used for pickling cast iron in vitriol. The acid ruins zinc and solder in a short time.

HEAT RESISTING PAINTS.

For painting exhaust pipes or mufflers, the Pacific Coast Gas Association recommends the following paints as being able to withstand anything up to a red heat:

Lampblack, 3 lbs.; graphite, 3 lbs.; black oxide of manganese, 1 lb.; japan gold size, 1 pint; turpentine, 1.5 pints; and boiled linseed oil, 1 pint. Powder the graphite and mix all the ingredients to a uniform consistency. Give two coats.

Or, black oxide of manganese, 2 lbs.; graphite, 3 lbs.; and terra alba, 9 lbs. Mix and pass through a fine sieve, then mix to required consistency with the following compound: Sodium silicate, 10 parts; glucose, 1 part; and water, 4 parts.

HOW TO SUSTAIN A POLE ON ROCK.

In line-building in mountainous sections, it is often necessary to sustain telephone poles on rock, says the American Telephone Journal, and instead of the ordinary method of making a hole in the rock by blasting, which takes a great deal of time, is very dangerous and expensive, the method illustrated in the accompanying diagram is used.

All that is necessary is to drill five 1¼ or 1½-in. holes in the rock and set an iron pin in each. A hole is bored in the butt of the pole and it is set on the central pin. Guy wires are run from the top of the pole to the other pins. The iron pins are secured in the rock by pouring sulphur or lead around them. An iron ferrule around the butt of the pole keeps it from splitting while being raised.

This is a great improvement on blasting, as it is almost impossible to blast a round hole of small diameter. A blasted hole of sufficient depth is funnel shaped, probably 3 or 4 ft. in diameter at the top and tapering toward the bottom.

DEVICE FOR SMOOTHING COMMUTATORS.

A simple device such as shown in the sketch, is very convenient in smoothing commutators. It consists of a block, Fig. 1,

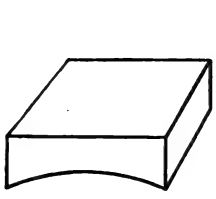


Fig. 1

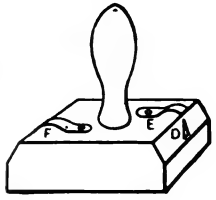


Fig. 2

of hardwood made to fit the circle of the commutator and just as wide, and having No. 00 sandpaper tacked to it. The sandpaper is put on with pointed pins at D, Fig. 2, and has little flat springs, E and F, to hold it down on the pins. These pins have an advantage over tacks, says a correspondent of the Engineers' Review, in that old paper may be removed and replaced with new more easily. A handle on the block keeps the fingers from getting caught in the dynamos.

In working with aluminum the best lubricant for the machine operation of milling is crude oil; for drilling, kerosene, and for turning, plenty of soap water.

SIMPLE ANTI-HUM DEVICE.

Persons annoyed by the humming of telephone wires may prevent the humming by using a piece of No. 14 insulated weatherproof wire, either iron or copper, from the pole to the house.—Contributed by E. H. Umdenstork, Osage City, Kan.

A SIMPLE RIG FOR WINDING COIL SPRINGS.

In the rig for winding coil springs shown here, the hooked or bent end of the spring is made first, as in Fig. 1. Fig. 2 shows the front elevation of the coiling block, and Fig. 3 the end elevation, the portion at A being rounded off to the same radius as the hooked end of the spring. A plan of the coiling clamp is shown at Fig. 4 and an elevation of it at Fig. 5.

To wind a spring with this apparatus, cut off the required length of wire, grip the coiling block in the vise and insert the wire in the block at the hole, B, and bend over the radius, A. Put the slot in the coiling clamp over the coiling pin, C, of the coiling block and, by means of the winged nut on top, grip the loose end of the wire, in the groove, D, cut in the bolt head.

Wind the coiling clamp around the pin, C, the requisite number of times, keeping the wire tight and even. Then slacken the wing nut and the spring will ease enough to allow the end to be pulled out of the hole. Take off the spring and make the eye in the opposite end by means of the two pegs shown at top of C. Fig. 6 shows the manner of making the eye. Use pliers to finish the end.

A correspondent of the American Machinist who describes this rig, says he uses 16-gage wire, 20 in. in each spring of 8 coils, and that a boy can make 25 springs per hour in this way.

LUBRICANTS FOR GASOLINE PUMPS.

Nearly all oils are absorbed by gasoline and for that reason the hemp or string used in the stuffing box of gasoline pumps must be kept moist with some liquid or semi-liquid substance which gasoline does not act upon.

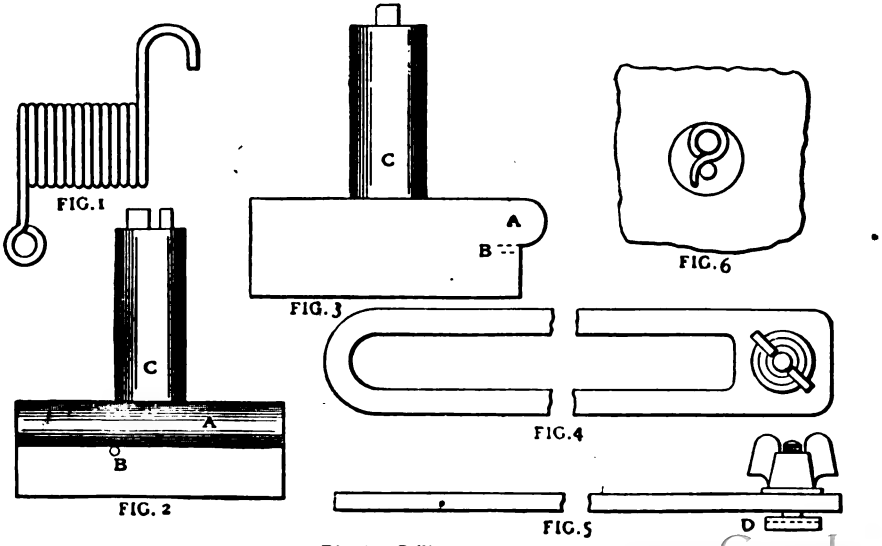
"There are two such substances," says Gas Power; "one is common soap and the other glycerine." First soak the string or packing with glycerine, then screw it down in the stuffing box and the joint will keep moist for a long while. If castile or laundry soap is handier than the glycerine, wax the string thoroughly and the results will be almost as good as with glycerine.

LIQUID FOR ETCHING ON STEEL.

Either for biting deeply into the metal or for producing a beautiful frosted appearance on the surface, the following liquid for etching on steel may be used:

Sulphuric acid, 1 oz.; alum, ¼ oz.; salt, ½ teaspoonful; vinegar, 1 gill; nitric acid, 20 drops.

The effect produced depends upon the time the liquid is allowed to act.



Rig For Coiling Springs

MARQUETRY WOOD STAINS.

Wood stains are now used largely in marquetry work instead of, as of old, inlaying the article of furniture to be ornamented with thousands of small pieces of veneer of various colors and sizes. The old process was slow and tedious, the new requires about one-fourth the time. The Decorators' Gasette gives some reliable formulae for these stains, which have hitherto been known only to manufacturers. They are as follows:

EBONY.

6 gals. water.
6 lbs. ground garnet shellac.
3 lbs. ground borax.
1 lb. water ebony A.

WALNUT.

5 gals. water.
5 lbs. ground garnet shellac.
2½ lbs. ground borax.
2½ lbs. Scotch soda.
15 ozs. water walnut A.

OAK.

6 gals. water.
6 lbs. ground orange shellac.
3 lbs. ground borax.
16½ oz. water oak.

PINE.

8 gals. water.
8 lbs. ground bleached shellac.
4 lbs. ground borax.
12 oz. water pine.

SATINWOOD.

5 gals. water.
5 lbs. ground bleached shellac.
2½ lbs. ground borax.
15 ozs. water satinwood.

MAHOGANY.

6 gals. water.
6 lbs. ground orange shellac.
3 lbs. ground borax.
18 ozs. water mahogany 10,522.

GREEN.

6 gals. water.
6 lbs. ground garnet shellac.
3 lbs. ground borax.
12 ozs. pure green P. G. M.

ROSEWOOD.

5 gals. water.
5 lbs. ground garnet shellac.
2½ lbs. ground borax.
1¼ lbs. water rosewood.

Directions for Mixing.—Put shellac and borax into the water, and boil until dissolved, and while still very hot, pour this over the staining color, but never boil up the colors to dissolve them, or they may be destroyed by the heat. Stir up well, and strain carefully when cold. Then bottle for use.

These directions apply to all the formulae, unless specified otherwise.

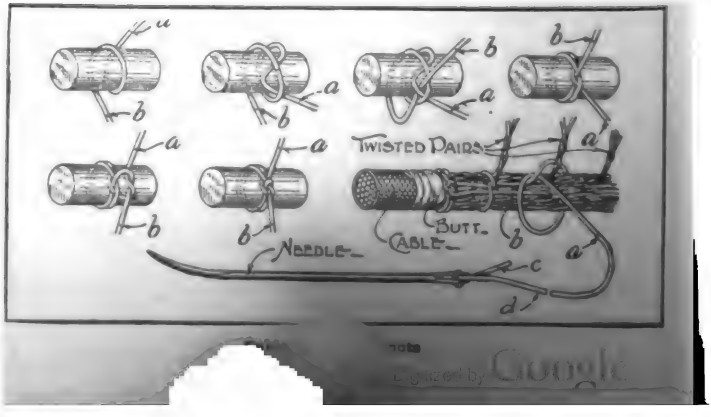
HOW TO MAKE LIME WHITEWASH.

Slack stone lime, not air-slacked, in hot water, keep stirring and use sufficient water to make a mass like mush when slacked. Thin with sweet skim milk, says the Master Painter, and you will have a whitewash which will not rub off if used inside, or wash off if used outside.

Another good method for ceilings is to slack, as in the first instance, and thin with a solution made of 1 lb. powdered alum dissolved in the least possible quantity of hot water and having sufficient lime added to make 10 qts. of whitewash. This will prevent suction and make a wash that will not work up under the brush when putting on a second coat. A little ultramarine blue, first wet up in water, added to the wash, will improve the tone and make a clearer job. For kalsomining, glutol is an excellent substitute for glue.

CABLE SEWING KNOTS.

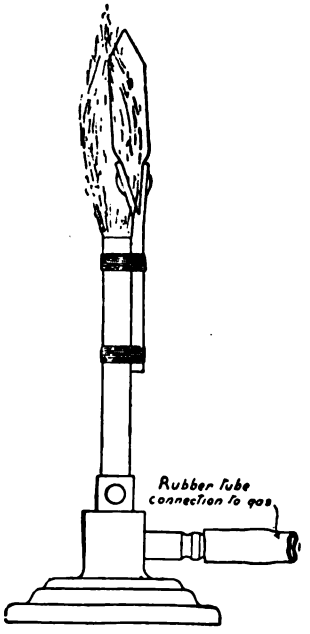
The illustration shows a number of knots used in sewing cables. In each instance A is the needle end of the cord and B is the short end. The "sewing" of the "form," says the American Telephone Journal, is done with a needle. Every lineman should know how to sew these knots.



SHOP NOTES

HOW TO MAKE A SELF-HEATING SOLDERING IRON.

A useful and simple self-heating soldering iron made like the one shown in the illustration will be found a great convenience to its owner.



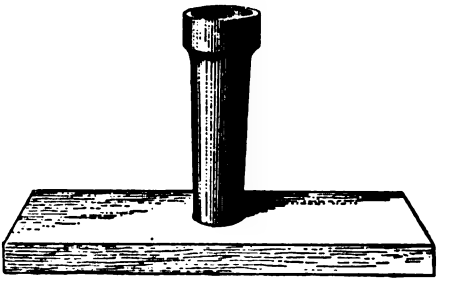
An ordinary burner, having an end off, has a soldering iron fastened to the end by means of copper wire bound around it. To use, the gas is turned on full and the iron allowed to get well heated. The gas is then turned half off or until the flame just fills the surface of the iron and comes quite to the point. The iron will keep hot quite a while, says the Model Engineer, London, and when cool, is quickly heated again by turning the gas up. This is a cleaner method than using the fire, and after a little practice the iron is not at all awkward to hold.

MAKING A SOLDERING IRON OUT OF SCRAP SHEET COPPER.

For material the copper bottom of an old wash boiler will suffice. Cut the copper into pieces about 1 in. square and put them in the melting pot. Place the pot in a large fire and bank up well with wet coal, as the copper will melt more quickly if the pot is covered up, says a correspondent of the Blacksmith and Wheelwright.

Burn the grease out of an old buggy wheel box until the box is clean and dry. In a piece of board bore a hole ½ or ¾ in. deep so the small end of the box will fit in as shown in the illustration. Pour the melted copper into this box, taking care to keep the face well away, as the molten metal may spatter.

If the copper cannot be punched out of

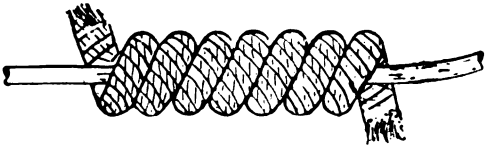


Mould for The Melted Copper

the box, break the box with a hammer. Good copper can be forged at a dull red heat, but if it will not hammer, rasp the end to the desired point. Cut off the right length, drill a hole in the blunt end, tap it out and screw in a ⅜-in. piece for a handle.

HOME-MADE METALLIC PACKING.

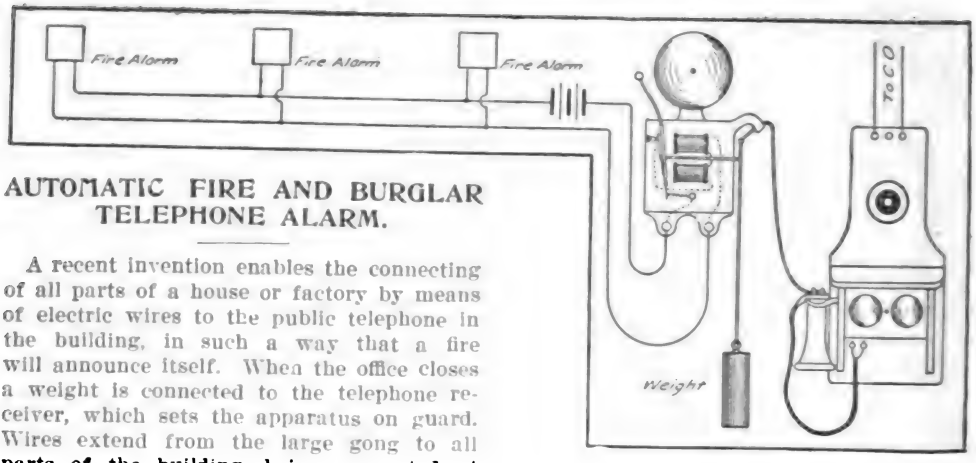
Where the size of the pump stuffing-box is wholly inadequate a home-made metallic packing, consisting of a combination of soft wire solder wound with asbestos wicking and dipped in a mixture of graphite and



Home-Made Metallic Packing

cylinder oil, may be used to advantage, says a correspondent of the Engineer's Review.

The packing will leak at first, but as it becomes fitted to the rod will gradually stop. The packing has not been tried on hot water, but being metallic would probably work alright.



AUTOMATIC FIRE AND BURGLAR TELEPHONE ALARM.

A recent invention enables the connecting of all parts of a house or factory by means of electric wires to the public telephone in the building, in such a way that a fire will announce itself. When the office closes a weight is connected to the telephone receiver, which sets the apparatus on guard. Wires extend from the large gong to all parts of the building, being connected at frequent intervals to thermostats. When a fire starts in any room the ceiling becomes hot, the mercury in the thermostat rises, thus closing the circuit, causing the gong to sound and lifting the receiver from its fork. This calls "central," who hears the gong striking and reports the fact to the fire department. By attaching ordinary electric burglar alarms to doors and windows a burglar alarm service is secured. If a burglar alarm system is already installed connection can easily be made in a few minutes by any electrician. It is suggested as an excellent means of safeguarding a house while the occupants are absent for the summer. Our illustration is by courtesy of the American Telephone Journal.

PERFORATED NIGHT SIGNS.

The latest destination signs which are carried on street cars are now made of perforated sheet metal, says the Street Railway

Perforated Sheet Metal Signs

Journal. One electric light is placed behind the sign which is a great improvement over the glass painted signs which are easily broken and when dirty are indistinct. The light shines brightly through the holes spelling out the letters which can be seen a long distance. Merchants can easily employ the same means for special announcements in night advertisements and any mechanic can readily fill an order for perforated signs on short notice and at trifling expense. The sign should serve as the front of a box inclosing the light which can be connected to any convenient socket with a flexible wire cord.

COMPRESSED AIR AT ALTITUDES.

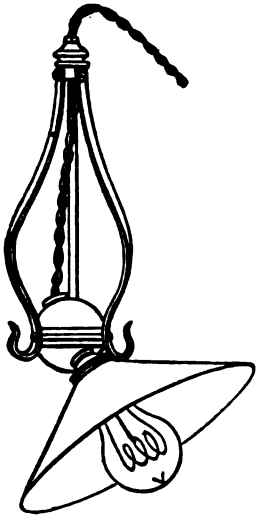
With increase in altitude the barometric or atmospheric pressure falls from 14.7 pounds per square inch at sea-level to about 10 pounds at 10,000 feet above sea-level. Since the density of the air decreases with its pressure it is obvious that at such an altitude the total weight of air handled by a given displacement is considerably less than at sea-level; and that to fill any volume—a rock-drill cylinder, for instance—with air compressed to 90 pounds, a greater free-air displacement will be necessary than would be required at sea-level. The relative capacities of a given displacement to do work—as in rock drills or pumps—at varying altitudes are indicated in the following table:

Feet above Sea-Level	Barometer Inches	Relative Capacities	Feet above Sea-Level	Barometer Inches	Relative Capacities
0	30	1.000	4500	25.36	.867
500	29.42	.983	5000	24.78	.836
1000	28.87	.967	6000	23.65	.827
1500	28.33	.934	7000	22.95	.800
2000	27.79	.936	8000	22.10	.778
2500	27.27	.924	9000	21.22	.750
3000	26.76	.909	10000	20.43	.723
3500	26.25	.894	12000	18.98	.677
4000	25.75	.879			

Twelve glass-head pin factories at Aix la Chapelle, Germany, average an annual output of 1,500,000,000 pins.

A HANDY LAMP PENDULUM.

A lamp pendulum which is adaptable for flexible cords is used in England, says the Electrical Review, London.



Lamp Pendulum

The sketch shows the arrangement. The cradle is attached to the flexible cord by cord grips, and inside the cradle rests a heavy ball through which the flexible cord passes, and to which the lamp and shade are attached. The ball is of sufficient weight to rest firmly on its seating and so holds the shade at any desired angle and keeps the cradle perpendicular at the same time the lamp is tilted.

TO USE OLD DRY ELECTRIC CELLS.

The cells of exhausted dry batteries will make good Grenet cells, if the bottoms are cut off and the filling and paper lining, if any, are removed. Be careful not to break off the carbon rod.

After the filling has been removed, if there is a paper lining, it may be removed as follows: Drill an exhaust hole through the cement in the top of the cell, then stand the cell in a watertight receptacle and fill the receptacle with water to within ¼ in. of the top edge of the cylinder. Let it stand until the paper lining is loosened and may be entirely removed.

The electrolyte to be used is 7 oz. of bichromate of sodium dissolved in 1 qt. of water. Add, very slowly, ⅓ pt. strong sulphuric acid, stirring the mixture slowly with a glass rod all the while. When the mixture is cool pour it into a glass battery jar and add 1 oz. bisulphate of mercury, which will amalgamate and keep amalgamated the zinc cylinder. The solution should be sufficient in quantity to extend up the zinc cylinder for three-fourths of its height. When not in use take the cylinder out of the solution.

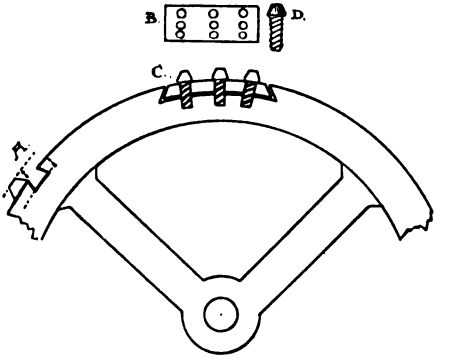
If while working with the batteries any of the acid or the solution should get on the hands or clothes, rinse off immediately with clean water. This experiment was sent us by a correspondent who has used it successfully.

HOW TO REMOVE PUTTY FROM OLD SASHES.

Cutting the putty with a knife and hammer is very apt to damage the woodwork. Instead, give the putty three coats of ordinary paraffin oil, allowing a half hour between coats. The petroleum will penetrate into the pores of the putty and dissolve the hardened linseed oil, making the putty plastic in a short time and in two or three hours it can be readily removed.

HOW TO REPLACE BROKEN TEETH IN GEARS.

To properly dovetail a tooth in a gear, requires a slot as deep as the tooth is high (A in sketch). If the gear is subject to hard work this will not hold, but will surely work loose. There seldom is metal enough to dovetail the proper depth without weakening the



Replacing Broken Teeth in Gears

rim of the gear. A method for light rim gears, that holds where all others fail, is as follows:

Bend a piece of boiler plate to the proper circle, as at B; dovetail it in the gear, as at C; make it a driving fit. Then drill through the plate and rim of the gear; tap out and screw in steel studs, as at D.

This will certainly hold because the studs are all solid in the boiler plate and cannot tear loose.—Contributed by Paul S. Baker, Muscatine, Iowa.

GETTING A BLOCK AND TACKLE TO THE TOP OF A STEEL STACK.

An engineer who had experienced some difficulty in getting a block and tackle to the top of a steel stack 38 in. in diameter

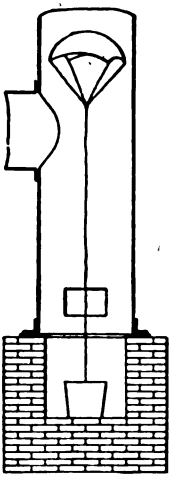


Fig. 1

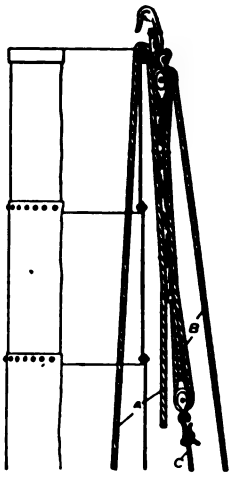


Fig. 2

and 80 ft. high, tells, in the Engineer, how at last he was successful. The stack had previously had a rope running through a pulley at the top for raising a block, but the rope had parted and come out of the pulley.

The materials the engineer collected to work with were a double and single block, 320 ft. of ½-in. rope, 200 ft. of chalk line, 200 ft. of common fish line, ½ yd. of cheesecloth, a stick 1x1x8 in., a pine board 1x12x16 in. with cleats on one side, 90 ft. of ⅝-in. rope, a pail and some wrapping twine.

The first thing to do was to get a line to the top of the stack. Four pieces of line, each 2 ft. long, were tied to the corners of the cheesecloth and the loose ends were tied to one end of the fish line. This formed a parachute. The other end of the fish line was tied to the handle of the pail, the loose length of the line having been run into the pail so that it might be rapidly paid out when required. The pail was then placed in the bottom of the stack and by means of a stick the parachute was pushed past the tee with which the boilers were connected (See Fig. 1). The air or gases soon lifted the parachute through the stack and out at the top, where it was possible to get hold of it. Then by means of the chalk line the ½-in. rope was drawn up through the inside and down the outside of the stack. The hook on the double block was replaced by one made of ⅝-in. steel and of suitable size to hook over the band at the top of the stack. The blocks were then threaded up with the other end of the ½-in. rope and pulled about 12 ft. apart.

The ½-in. rope, A, Fig. 2, was now hanging on the outside and to this was attached the stick to which the tackle had previously been bound. The old ⅝-in. rope, C, was tied into the hook of the single block and the tackle hoisted by pulling the rope, A, down and out through the manhole in the stack. Getting the hook over the stack band required some patience, but was finally accomplished. When secured, a few hard pulls on the various ropes broke the wrapping twine by which the tackle was bound, and the rope, A, fell down on the inside of the stack, and the stick fell on the outside. The single block was then pulled down by means of the rope, C, and a swing, Fig. 3, made of the 12-in. board attached. The engineer then collected his painting materials and with the aid of an assistant pulling on the rope started up. It was only necessary to make three trips to the top, as a white-wash brush attached to a broom-

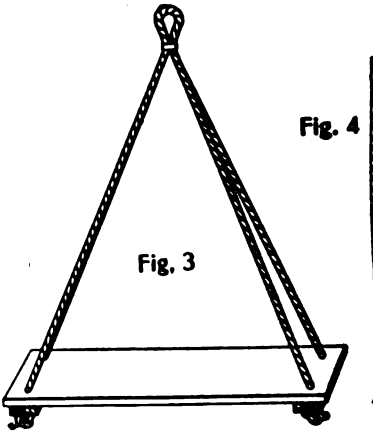


Fig. 3

Fig. 4

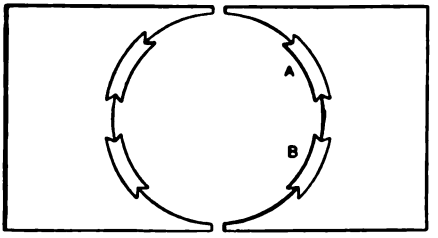
stick enabled him to reach one-half the circumference of the stack. Fig. 4 shows a safe hitch which is quickly made and by means of which the man fastened himself at whatever point he wished to stop.

The thinnest coat of paint and varnish that will give a good finish should be used for cars, and they will not crack so soon. Too much varnish is often the fatal mistake made in this line.

ANOTHER METHOD OF BABBITTING CRANKPIN BRASSES.

Old worn-out crankpin brasses may be babbitted in the following manner and made as good as new, says a correspondent of the Engineer's Review:

Dovetail places into the brasses on the quarters as shown in the sketch, leaving a space of about ¼ in. on a 2½ in. pin. The dovetailed part need be only 1-16 in. deep to hold the babbitt in place and from ½ in. to ¾ in. is quite wide enough for the babbitt. A pin fixed in this way does not



Babbitted Crankpin Brasses

wear quite so flat and makes a smooth running box; it wears better than brass and requires less lubrication.

GRINDING CAR WHEELS AT SLOW SPEED.

In some St. Louis street car shops it has been discovered that better results are obtained by removing car wheels from the trucks and grinding them at a slow speed than by the old method in which the wheels, run at a high speed by the motors under the car, were ground under the car.

The wheels removed are run at 6 r. p. m. This speed is regulated by means of a countershaft fixed above the wheel grinder, says the Street Railway Journal, from which a belt is run to a split pulley which is placed on the car axle. The excellent results obtained make the means worth while.

REPAIRING A THERMOMETER.

For a thermometer in which the mercury has separated try the following remedy:

Place the thermometer in a long stocking, having the bulb toward the toe and then grip the stocking tightly at the top and whirl rapidly. The centrifugal action will drive the mercury to the bulb, and the thermometer will be as good as new.—Contributed by Raymond J. Edwards, Shullsburg, Wis.

WHY WAGON WHEELS ARE DISHED.

The reason for dishing wagon wheels can very easily be demonstrated by making a couple of tin wheels for one axle of a child's toy wagon, says a correspondent of the Blacksmith and Wheelwright. If the wheels are made straight, as shown at A,

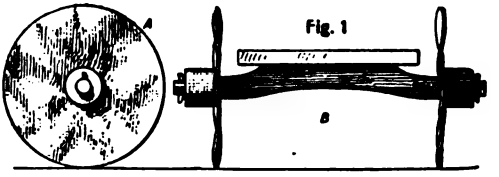
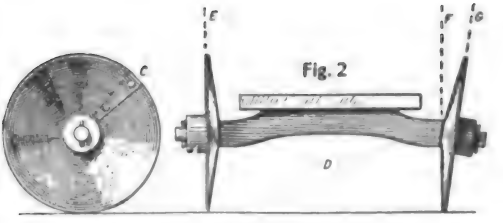


Fig. 1, they will take the shape shown at B, Fig. 1, a very short time after being in use, especially is this true when the wagon is loaded. The hubs of these wheels are made of a bit of wood nailed to the tin.

The superiority of the dished wheels is shown in Fig. 2. The tin wheel is cut into at C, lapped over to the dotted line and riveted or soldered into a flat cone. This wheel put on the axle at the proper angle will stand a great deal of hard usage. The difference is in the degree of stiffness obtained in the two forms of wheels. The dished wheel is stiffer than the flat one and so will not easily bend and wobble. Put on as shown at E, Fig. 2, however, the dished wheel will not stand constant usage and loading. The spokes in the hub will become loose and the only remedy is to cut out a piece of the rim and reset the tire causing a greater and rather unsightly dish,

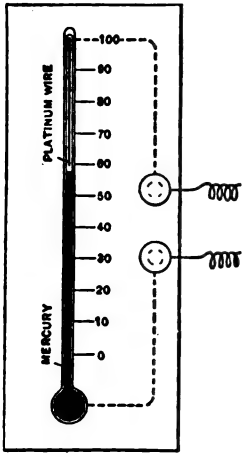


which will probably have to be increased in time.

If the wheels are "gathered" at the bottom so that the spokes below the hub stand parallel with the vertical line, F, Fig. 2, the wheel will carry its load direct through spokes, rim and hub and there is no undue strain on the spokes. The gathered wheel throws mud in the direction of line G, away from the wagon instead of into it and is preferable for this reason also.

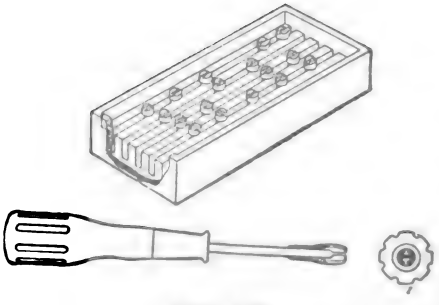
A TEMPERATURE ALARM.

Temperature alarms are of great service in greenhouses where a drop of a few degrees may mean a loss of a goodly sum to the florist. There is a thermometer on the market, having a platinum wire in the bore and suitable connections to electrical terminal posts on the thermometer board, says a correspondent of the Metal Worker. The platinum wire can be adjusted to any desired temperature and to effect the alarm, the wire is connected up so that a metallic circuit is broken whenever the temperature drops below the set point and the alarm bell rings. The apparatus connected up with suitable bells and batteries and installed so that the alarm can be heard in any part of the greenhouse costs less than $10.



TRAY FOR HOLDING SCREWS.

If a box of screws be poured into the tray, constructed as shown in the illustration, and it is then shaken two or three times, every screw will fall into the grooves head upward, says the American Electrician.



Screw Tray

If small brads are driven in the tops of the ribs (not shown in cut) the screws will fall into the grooves more readily. The screwdriver is then pressed over a screw, the spring sides of the tray being stiff enough to hold the screw so it can be entered and screwed until pressure comes on. Then the driver revolves part of a half turn, until the positive drive blade slips into the slot of the screw head and a firm pressure can be applied and the screw picked out.

GOOD PACKING FOR A STEAM CHEST.

One-sixteenth inch asbestos sheeting makes a good packing for a steam chest. This material costs about 45 cents per yard and if put on wet will bear 150 pounds steam pressure. In tests with this packing a joint was broken six times and tightened up satisfactorily with the wet asbestos. It is just as tight as the best rainbow packing can ever be made.—Contributed by T. H. Konrad, Burlingame, Cal.

HOW TO REPAIR A SPIRAL SPRING.

A spiral spring, 1 in. in diameter, which was used in an engine governor and which parted in the middle one morning just before starting up, was repaired by a correspondent of the Engineer's Review in the following manner:

Spiral Spring Repaired

Four holes were drilled in a piece of steel as at A, and the broken ends of the spring were forced through the holes into position as at B. The spring was then replaced and the engine started. The job took about 30 minutes.

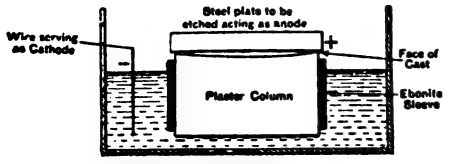
HOW TO THAW DYNAMITE.

A safe and sure way of thawing out dynamite is as follows:

Procure a small box or a nail keg just large enough to hold a lantern, and knock the bottom out of it, to admit air so the lantern will burn. Tack a piece of burlap over the top, on which to lay the dynamite, and set the apparatus a safe distance from all buildings. Throw an old coat or a sack over the dynamite. The heat can be regulated by turning the lantern up or down. "I have used this method of thawing dynamite for four years," writes N. G. Hall, of Parker, S. D., "and have always had the best of results."

ELECTROLYTIC PROCESS FOR ETCHING STEEL.

A process of electrolytic etching, invented and patented by a German, makes it possible to obtain exact reproductions of articles in low relief, such as medals and coins, in hard steel. The principle of the process is quite simple. Plaster of paris is poured upon the



Arrangement for Electrolytic Etching

article, let us say a coin, sufficient to form a column several inches high and a cast is taken. The plaster of paris is then removed from the coin and fitted with an ebonite sleeve, leaving exposed only the face and the corresponding blank at the opposite end of the short column of plaster.

A vessel containing an electrolyte, such as ammonium chloride, is prepared and the cast placed face upward in it, so that the face projects above the level of the liquid, and the liquid can only reach the face by absorption through the column of plaster. The piece of steel on which the reproduction of the coin is to be etched is placed on the face of the cast and is made the anode of the cell. A wire spiral placed in the liquid in the vessel is the cathode. Thus the steel plate rests on the high parts of the cast and at those points flows a current which dissolves the steel and the liquid steel flows into the cast. This process is kept up until the whole surface of the steel is in contact with the surface of the cast. Of course the process involves a number of details.

The best electrolyte is made by electrolytically dissolving an iron anode in a solution of ammonium chloride. Every five or ten seconds the steel must be cleansed of its constituents, notably carbon, which are left as it is dissolved. A reproduction of a coin can be etched on a steel blank in about three hours. A high voltage—10 to 15 volts—

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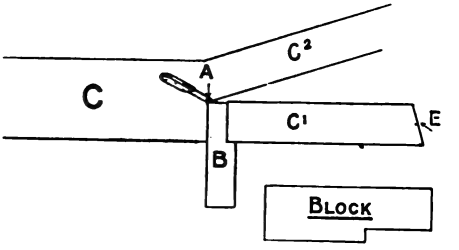
CEMENT FOR BELTS.

Cook thoroughly 6 oz. of Peter Cooper's white or cream glue and when it is well done add 2 oz. of powdered white lead. Mix well. Use same proportions for larger quantities. For use for any length of time in summer leave thick and thin down with alcohol. When thoroughly cooked turn out into something to cool. Cut off a piece as wanted. In applying, make the splice the same length the belt is wide, hammer it well together and the belt can be used in one hour. A correspondent of Power says he has used this cement for six years and has never had a splice come apart.

HOW TO CUT BELT LACING.

In the diagram the various parts are as follows: A, sharp pocket knife; B, block; C, belt lacing, C^1, size of strip to be cut; C^2, other part of C; E, end of lacing. Place the left hand on B, holding it firmly and with the right hand take hold of E and draw it



Cutting a Belt Lace

towards you. The knife, A, will cut C in two equal parts, providing C has a straight outer edge. In this way C can be cut straighter than a string. The cut in block, B, may be any breadth or depth. The pocket knife should be driven into the bench or other base and must be very sharp.—Contributed by R. V. Archambault, Norris, Mont.

PAINT FOR SHIPS' BOTTOMS.

The following recipe is recommended by the Master Painter as a good paint for painting the bottoms of ships:

Eight lb. of rosin; 1½ lb. of Cologne brown dry color; 15 oz. of shellac; 25 gills of alcohol; 6 gills of benzine; ¼ gill of toluene and 10 drops of pyridine. Finish with a coat of paraffin wax and white lead boiled together and applied hot.

HOW TO MAKE GLASS SLEEVES FOR MACHINE BOXES

Their Use Makes Lubrication Unnecessary—Many Persons Experimenting with Them.

A very fair bearing for a common box can be made from broken bits of bottle or plate glass. Many machinists and power transmission people who desire glass journals for

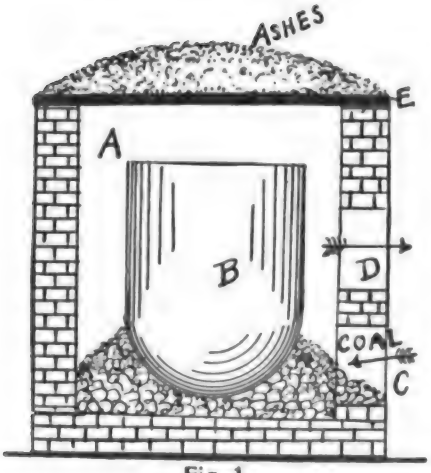


Fig. 1

special purposes give their orders to the glass works where any required pattern of sleeves can be manufactured. The glass manufacturers have every facility for making glass journals, but, as a rule, they are obliged to make excessive charges for special work of this kind; and besides, they cannot very well make just what one wants from drawings. Therefore, many people who are interested in the use of glass sleeves in journals for machinery, shafts for power transmission, engine bearings, etc., undertake to make the bearings themselves. There are many experiments in progress in the glass bearing line at the present time, and several different processes for making glass sleeves are in use at various important machinery centers. In some shops quite elaborate apparatus for the melting of the glass and


Fig. 2

casting the same has been installed; in others, the workman may be seen melting some broken pieces of glass over a fire with a ladle, he then pours the melted substance into the sand mold. Before we undertake to make any glass bearings, either in a crude way or in a mechanical way, let us observe the grades of glass used.

The Japanese use glass bearings for the purpose of saving oil. In fact they do not apply any oil at all to lubricate the journals fitted with glass sleeves. They take ginger ale bottles and break the pieces fine with a hammer and melt them. Flint glass is used by some of the American makers. The grades of glass in which silicate of potash and oxide of lead are prominent are considered the best grades. These are flint, crystal and strass. The coarse green bottle glass, which is so often used and which is so readily obtained, includes in its physical make-up silicate of soda, alumina, lime, and oxide of iron. The chief reason why one sees this grade of glass used frequently is because it is always convenient. Some of the glass bearing makers and users evidently consider all species of glass alike. The English crown glass is sometimes used, also the refractory Bohemian types. There are two ways: One is to select the glass from bottles or broken window panes; the other is to go direct to a glass works and purchase the kind of glass desired. Common white is a good sort to buy. If one uses bottles, he may as well use whatever is handy, and mix

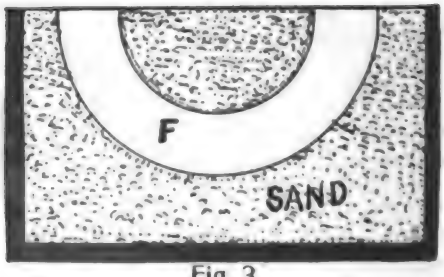


Fig. 3

and grind all together, as an assortment, except by an expert is not possible. But even when the glass is ready, and the pieces all broken up, so they have a degree of uniformity, the work is only begun.

For melting, an apparatus like the one shown in Fig. 1 is recommended as good, but such an apparatus involves both labor and expense. As a substitute one might melt the glass in an ordinary melting ladle. (Fig. 2.) In a shop, where it is intended to fill orders for glass bearings, it is a good plan to erect the brick or stone enclosure as shown in Fig. 1. This should be of proper dimensions to accommodate a crucible 3 ft. high and 20 in.

in diameter. Such a crucible can be purchased at a foundry. The melting of the glass is best done if the crucible is enclosed. Therefore build up the walls to make the chamber A. Have the inlet for the coal at C and the outlet for the draft and smoke at D. Cover the top with sheet metal, C, and to keep the heat in cover the sheet metal with ashes. Pack the crucible, B, with the broken glass and cover it. Put the crucible in through the top of the chamber. Cover the chamber, make a coal or coke fire and keep it up until the glass is melted. Then remove the covers and ladle out the melted glass. This is a first-class method, but as before stated, the glass can be melted in a common open ladle (Fig. 2) over a hot coal fire.

The next part of the process is the pouring and moulding. It is a good plan to make some sand moulds precisely like those used in the foundry for casting metals. Fig. 3 is a plan of one of the sand moulds. Use moulding sand and shape the form of the article to be cast in the sand as at F. Pour the glass direct, or use the usual gate and runners of the standard flask. Fig. 3 is a sectional view.

First cast very plain sleeves in open flasks and finish the exposed side by grinding on an emery wheel. After a while, almost perfect sleeves may be cast ready for use, by employing the facilities of the finished flask. Some of the sleeves are cast round complete as in Fig. 4. Fig. 5 is a view lengthwise of this design of glass bearing. The glass bearing is often supported in a cushion of rubber or a padding of felt. Sometimes, if thick, it rests directly upon the metal. Fig. 6 shows the arrangement frequently used when the sleeves bear in metal boxes. The shaft, G, contacts direct with the glass facing of the sleeve. The sleeve is supported in the metal frame of the box, H. This part of the box fits into the journal of the hanger or machine frame. Some of the boxes are put up as illustrated in Fig. 7. This involves either a tight fit of the glass sleeve or ridges provided on the sleeve to fit into corresponding grooves in the metal cap or seat of box. The adjustment of the ridges and the grooves prevents the sleeve from working out of its position. Some of the glass sleeves are made up in sections as illustrated in Fig. 8. Sometimes the sleeve is in one complete part, again in two halves and then again in four parts, as in this case; sometimes the sleeves are capped at the ends with metal enclosures and these caps protect the edges of the glass.

After the casting of the sleeves comes the smoothing and finishing. Some of the sleeves will be warped and crooked and have to be

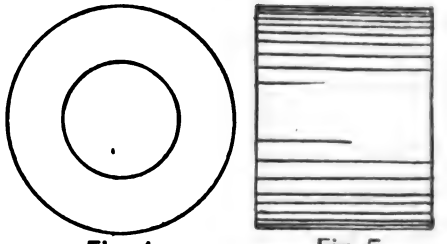


Fig. 4 Fig. 5

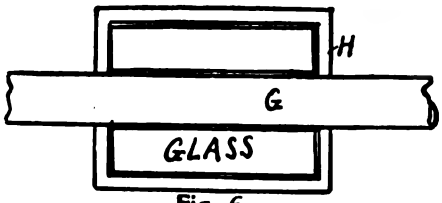


Fig. 6

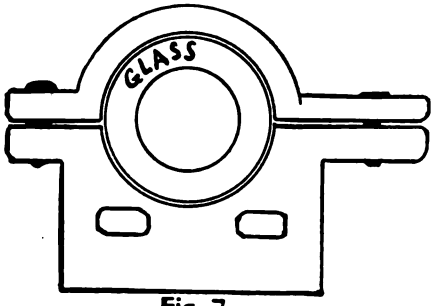


Fig. 7

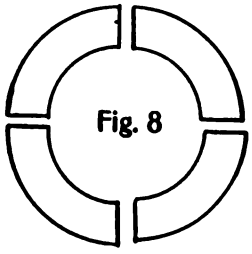


Fig. 8

remelted; others are cracked too badly for use; some are very rough and the roughness must be ground off on the emery wheel. This is quite fine work. In fact, all of the glass sleeves must be subjected to more or less grinding to get them into the proper

order for use. After the final grinding, rub the parts with an oily cloth, and then the sleeves are ready for work.

The object of the glass bearing is to do away with lubrication. Glass sleeves are used on water wheels, where the water constantly moistens the bearings, and no oiling is necessary; but in nearly every other instance of the use of the glass sleeve, it will be found that a drop of oil is slyly deposited in the glass bearing. Almost all makers of glass sleeves, however, declare that no oil is needed. The .glass sleeves are hard and smooth, and for sewing machine bearings, etc., may run without oiling, or at least with little oil. In the large shafts, however, although practically no lubrication is made, daubs of grease plastered against the sides, "just to help out," may be observed. No oil holes are bored through the glass sleeves.

Despite these contradictory facts, the indications are that there is a future for glass bearings and many intelligent men are experimenting with them in spare hours.

"Traveller."

ANOTHER METHOD OF CUTTING A FINE-TOOTHED SAW.

The following method of cutting a fine-toothed saw is recommended as a better way than the one described on page 347 of the March Popular Mechanics.

Clamp a clock spring or corset steel in the vice firmly. To cut the teeth hold a sharp and hard cold chisel so that its front

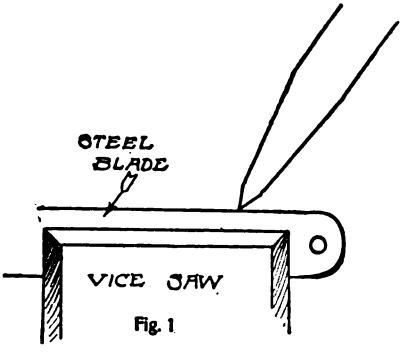


Fig. 1

cutting edge stands nearly plumb (see cut), then with a light hammer strike a blow of sufficient power to cut to the depth required. Now place the chisel on the steel and draw it toward the tooth just cut. When it strikes against the burr thrown up by the first cut, strike again with the hammer, being careful to strike with the same power as in making the first cut. Repeat this until all the teeth are made.

By using a fine chisel and light hammer, saws may be cut as fine as 30 to 40 teeth to the inch, and with heavier tools, as coarse

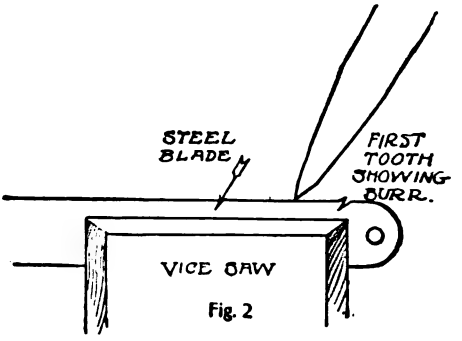


Fig. 2

as 12 to 16 teeth to the inch. After a little practice anyone can cut these teeth as fast as he can strike the blows.—Contributed by C. G. Evans, 380 Bowen Ave., Chicago, Ill.

THE DANGERS OF A SCRATCH

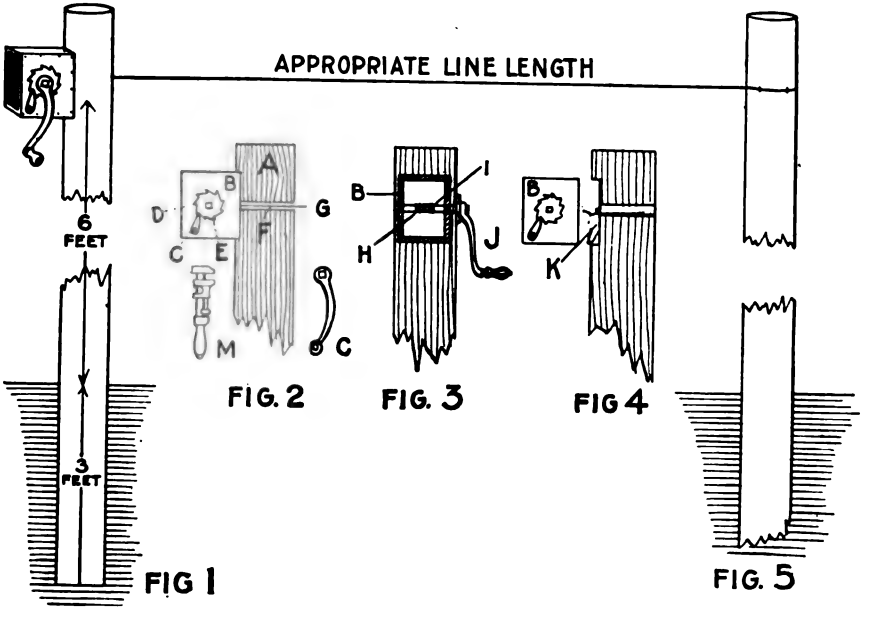
Scarcely a day passes that many workmen do not, in some way or other, get a scratch, a small cut, or a bruise that may break the skin. In most instances not the slightest attention is paid to this beyond the temporary annoyance of the pain and the possible irritation when the hands are put into water, or some subsequent blow in the same spot brings an exclamation on account of the hurt.

This, while a common practice, is by no means a wise one. The air is full of floating disease germs, especially the air of cities and towns, and an injury of this sort, be it ever so slight, might furnish excellent breeding ground for some deadly bacteria. It is a good plan always to keep a bottle of prepared carbolic acid and glycerine, and frequently touch all bruises or sore spots with it. This is one of the most convenient and effective germicides imaginable. It is believed that many cases of fever and other serious ailments can be contracted by a floating germ coming in contact with the abraded skin. Once snugly lodged in this most congenial dwelling-place, the germ multiplies with amazing rapidity, and soon overruns the entire system. Therefore, whenever there is a bruise or scratch, or any injury of this sort, germicidal applications should be at once resorted to.

HOW TO MAKE A CLOTHES LINE TIGHTENER.

To keep clothes line wires from sagging when hung full of heavy damp clothing, the following contrivance will be found efficient and can be made by anyone.

Procure a strong, straight-grained fence post, 9 ft. long, and saw a section about 8 or 10 in. from the top, as at K, Fig. 4. Bore a ¼-in. hole through the post as at F, Fig. 2. Set the post in the ground to a depth of 3 ft., tamping the earth around it firmly. The post must be well set, as there will be considerable strain.



Construct a boxed enclosure with a ratchet wheel and ratchet as at B, Fig. 4. Nail this box in the post at K, Fig. 4, run the wire through the hole in the post on to the ratchet shaft, H, Fig. 3, and then run the wire from this post to another post or to a building. Attach a crank, as at C, Fig. 2. If there is no crank to be found use a monkey wrench. The apparatus is now in working order. All that is necessary is to turn the crank on the ratchet until the wire is stretched as tight as desired.—Contributed by Leroy L. Kenny, Hawarden, Iowa.

Pencil drawings may be fixed to stay by applying a coat of 3 oz. gum mastic dissolved in 1 pt. of alcohol. Put on with a brush.

TO GIVE WOOD AN EGGSHELL POLISH.

Make a polish of 3 parts shellac, 1 part mastic resin, and 1 part sandrac resin, dissolved in 40 parts methlyated spirits. Apply with a rag.

RECIPE FOR FRENCH POLISH.

Dissolve thoroughly ¾ oz. gum benzoin, 3 oz. gum juniper, 14 oz. orange shellac, ¼ oz. dragon's blood powder and ½ oz. powdered borax in ½ gal. methylated spirits of wine contained in a bottle. Strain through thin muslin.

HOW TO SOFTEN CAST IRON.

Put a cap or plug in one end of a piece of gas pipe larger and longer than the work to be annealed. Put a layer of equal parts of sand and powdered charcoal mixed together into the pipe, put in the work, and then fill the pipe with the sand and charcoal mixture, tamping down lightly. At night, heat to a red heat, cover well with hot coals and then with green coal and leave until morning. Remove from the forge in the morning and set aside to cool. A correspondent of the American Blacksmith says finished work can be annealed in this way.

JACKS FOR HOLDING AND LIFTING PUMP PIPES.

In Fig. 1 is shown a jack and its parts in detail for holding pipe. The jack may be made of either 1¾ in. by ½ in. steel very good iron tire or of 1⅛ in. square axle stubs taken from an old carriage axle, says a correspondent of the American Blacksmith.

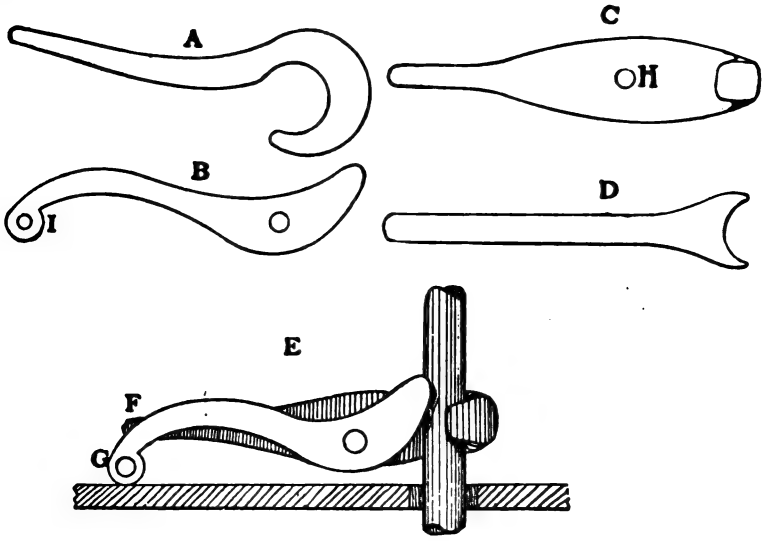


Fig. 1—Pipe-Holding Jack

The hook or claw which holds the pipe is shown at A, and a side view of it, showing the manner of forging so as to strengthen it at H, where a hole is drilled to receive a ⅝ or ¾ in. rivet, is shown at C. This claw is made for 1¼-in. pump pipe, the size most commonly used. The lever and rest is shown at B. It should be curved in the arm so that when in use the hook cannot touch the platform to loosen the hold on the pipe. D shows a top view of B. The hole I, in the lever, B, is for receiving a chain or rope when using the tool over an old-fashioned well or cistern, and prevents the tool from falling in and being lost. The rivet holding the parts together should be strong and fit like that in a pair of tongs. The tool opens and closes by lifting away from G.

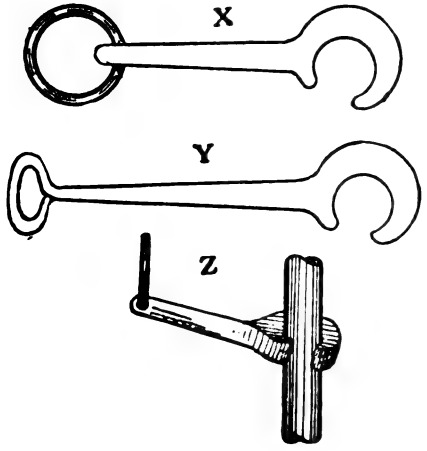


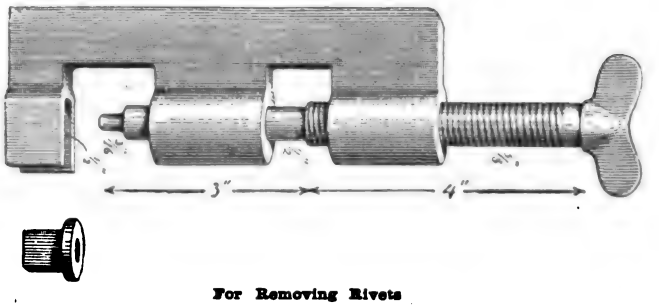
Fig. 2—Pipe-Lifting Jack

For lifting and lowering pump pipes a tool like the one shown at X is satisfactory. it may be used either with a rope or by passing a bar or hand spike through the ring, so that two men can lift on it. It is made of 1⅛-in. axle stub of square stock. the opening being just large enough to let the pipe into the hole of the tool which should be but ⅛ in. larger than the pipe. This tool is shown in use at Z.

A tool for hand use is shown at Y, and it may be used singly or in pairs. The ring at the end provides hand-hold and it is turned out of the handle solid, just like a poker hand-hold. The light part should be ¾ or ⅞ in. round and the rest 1⅛ in. square. A set of these tools should comprise a jack as at E, rope and a lift like X, or a jack and two hand lifts like Y.

DEVICE FOR REMOVING BROKEN RIVETS

For removing broken rivets in buggy bow sockets the device shown in the sketch is guaranteed by a correspondent of the Blacksmith and Wheelwright to be all right. The sketch is self-explanatory. For the inside end of a rivet, place a washer large enough to go over the head of the rivet to hold it firm in its place. There is no danger of breaking the socket in using this device, and one man can do the work more easily and quickly than by the old method.



For Removing Rivets

HOW HORSEPOWER COMPARES WITH MANPOWER.

The measurement of a horse's power of work, first ascertained by Watt, the inventor of the steam engine, was founded upon the basis that the average brewery horse was capable of doing work equal to that required to raise 330 lb. of weight 100 ft. in one minute, or 33,000 lb. one foot in one minute. This estimate, however, was for one minute; it would not be possible for a horse to perform this amount of work continuously for eight consecutive hours. One horse could exhaust 12 men in a single day, for where a strong man could perhaps pull half of 330 lb. to a height of 100 ft. in two minutes, he probably could not repeat the operation more than a few times. A man's power is about one-tenth of a horse's power. That is, where a horse could pull 330 lb. to a height of 100 ft., one minute, and then slack up and repeat the operation, for eight hours, thus pulling four hours, and slacking up four hours, it would require ten strong men to perform the same amount in that length of time. When man put horses to work the gain in labor for the world was thus tenfold. Multiply this by steam power, water power, air power, and above all, electric power, and one has a problem in mechanical progression.

RULE FOR CONSTRUCTION OF ELLIPSE

The following on the construction of ellipses may be of interest to many mechanics, as this subject is not taught in public school text books. I had occasion to use this rule but recently in certain designs, and noting certain comments on ellipses in April Popular Mechanics, offer this for the benefit of those who are interested. The difference between the squares of the axis of any ellipse is equal to the square of the difference between the foci.

To reduce this rule to a formula, let

L = Long axis.
S = Short axis.
D = Distance between foci.

Then

$L^2 - S^2 = D^2$.

To construct an ellipse of any given dimensions, say, with long axis 5 in., short axis 3 in., substituting in formula—

$L^2 = 5^2 = 25$
$S^2 = 3^2 = 9$
$25 - 9 = 16$
$\sqrt{16} = 4$ = Distance between foci.

To construct ellipse, insert pins in line of long axis 4 in. apart, or ½ in. from each end of ellipse to be constructed. Then with a loop 4½ in. long draw ellipse.

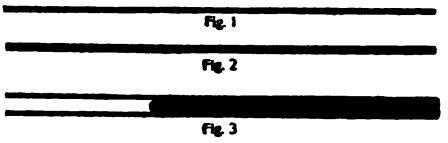
In addition to the remark in April Popular Mechanics that the curve of the distances of any point on the curve from the foci is always the same, it may be added that this distance is always equal to the longer axis.—Contributed by W. G. Frisbie, Athens, Pa.

A CORRECTION.

The article entitled "Using Motorcycles for Shop Power," which appeared in our May issue was by mistake credited to the American Blacksmith instead of to the Blacksmith and Wheelwright in which paper this interesting kink first appeared.

A LESSON IN FRESCO PAINTING.

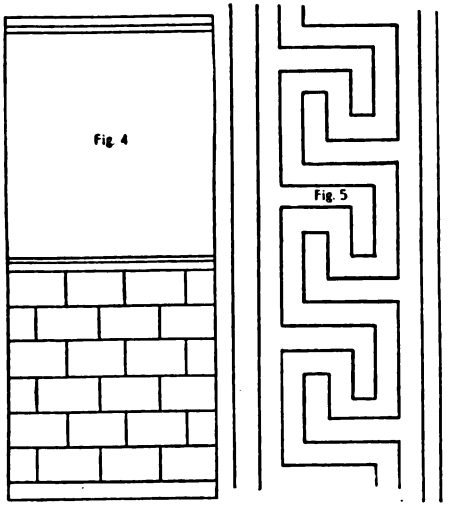
The materials required by the beginner in fresco painting are a perfectly straight piece of wood, 3 ft. long, 2 in. wide and of about the thickness of a lath, and a brush, called a "fresco liner," made of white bristles, and varying in size from ¼ in. upwards. The smallest size is best for the beginner, says



a correspondent of the Western Painter. It is not only cheaper, but if mastered first, it will not be hard to learn to handle the larger sizes. To practice with use black marking ink, which flows evenly and is easy to use.

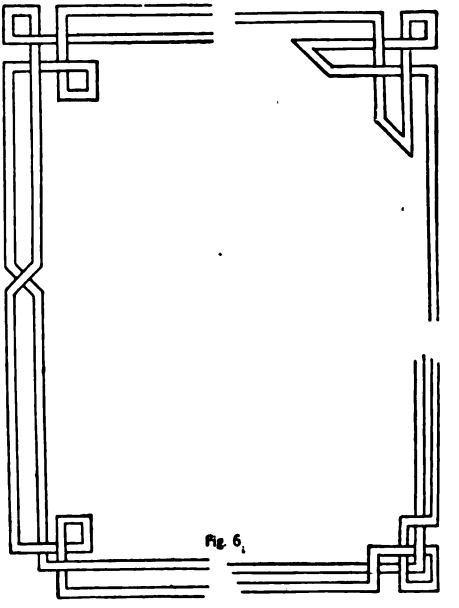
Good lining is the first thing for the amateur to master. If he practices until he can make perfectly straight lines of uniform thickness and having neatly joined corners he has gone a long way toward becoming an expert fresco painter.

To begin work select a smooth board surface or wall space and hold the straight



edge against the wall, using the left hand and grasping it at the extreme left end, the back of the hand being against the wall and the thumb facing the body. The right end of the straight edge should touch the adjoining wall; the straight edge does not lay flat on its surface. Take the brush in the right hand, holding it at the extreme end of the 10-in. wooden handle between the thumb and first finger. Dip the brush in the fluid, touch it lightly against the side of the pot to remove all excess ink and, starting at the left, run the line lightly to the right. Do not hesitate or the line will waver, due to varying pressure.

When able to make such lines perfectly, try making lines several times as long. Make first a guide line by fastening one end of a 6 ft. line to the wall with a tack, drawing it taut and running a piece of char-



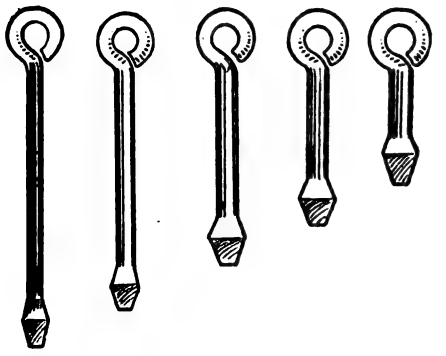
coal over it. Then stretch it perfectly tight and level along the wall and pull it out at the middle and let it snap back against the wall. Repeat this several times and a fine guide line will result. In practicing on long lines be very careful to join the strokes neatly.

The illustrations show some lines to practice on. Fig. 1 represents a fine line made with a light, quick stroke; Fig. 2 requires a heavier brush; Fig. 3 is made by filling in between two fine lines, using another brush, and Figs. 4, 5 and 6 show various decorations which may be executed by the amateur.

On an average from 10 to 12 lb. of hard coal, or 18 to 20 lb. soft coal can be burned on one square foot of grate. Nearly double this amount can be burned with forced draft.

HOW TO MAKE A GOOD SCREW DRIVER.

Take ⅜-in. round spring steel and forge the end to the proper shape. Bend an eye in the other end. For hard work place a bar through the eye. There is no handle

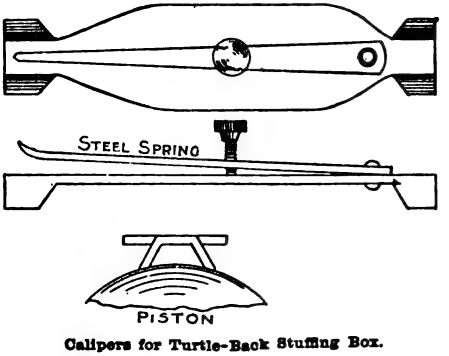


Set of Screw Drivers.

to come off, and if the point breaks it can be forged again. The long one, or lazy man's driver, should be about 30 in. long; the short one about 8 in. long.—Contributed by Paul S. Baker, Muscatine, Iowa.

HOME-MADE TURTLE-BACK STUFFING-BOX CALIPERS.

The illustration shows top, side and end views of some turtle-back stuffing-box calipers which any engineer can make and will find them a valuable addition to his kit of tools. The calipers are used for tru-



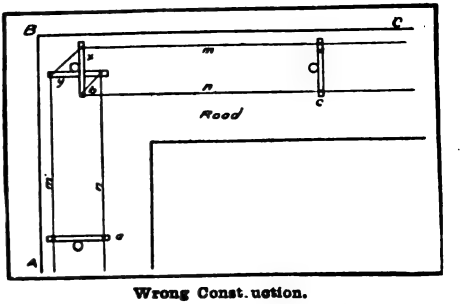
Calipers for Turtle-Back Stuffing Box.

ing up the piston in the stuffing-box.—Contributed by W. O. Fischendorf, Mt. Vernon, Ind.

An excellent marking ink, which dries quickly, will not spread and is almost indestructible, may be made by dissolving asphaltum in turpentine to a thin fluid.

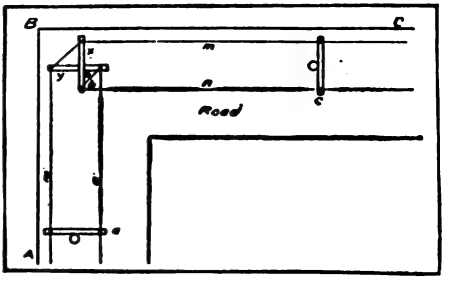
TURNING CORNERS WITH TELEPHONE WIRES.

Editor Popular Mechanics: On Page 444, of your April issue, I notice an article on telephone line construction. The description is right, but the artist got the pole on the wrong side of the crossarm. The cut shows as follows:



Wrong Construction.

As shown above the pull comes so that the strain is on the bolt or lag screws instead of on the pole. The proper way is to place the crossarms as shown in the cut below, viz.:



The Right Way.

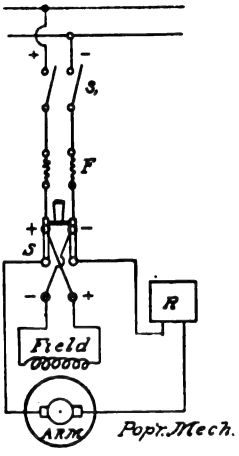
I have frequently seen crossarms pull off when faced as shown in the first cut.—John Reiland, Lena, Ill.

COOLING A DYNAMO.

A dynamo which had given considerable trouble heating and cutting of brushes and commutators was arranged by a correspondent so that it was kept cool by its own power. An electric fan was placed on a stand just high enough so the current of air would be thrown on the armature. The fan was then connected with the wires from the generator and there has been no trouble from heating since.

SIMPLE WAY OF REVERSING A MOTOR.

The diagram shows a simple way of reversing the direction of a motor with a double pole double throw switch. The fields are in circuit as soon as the main switch is closed and by using the double pole double



Plan of Wiring

throw switch on one side the motor runs one way, and by changing the switch the motor runs in the opposite direction. An ordinary rheostat is used for controlling the armature. —Conducted by G. H. A., Chicago.

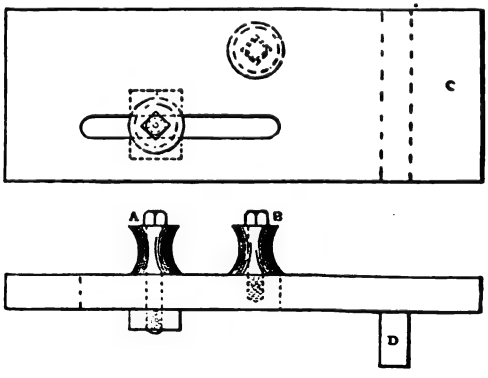
DRIVING AND HOLDING POWER OF CUT AND WIRE NAILS.

Prot. Carpenter of Cornell has made some experiments in nail driving. These experiments would seem to establish: First, very much more force is required to drive a cut nail a given distance than a wire nail. Second, more force is required to start a cut nail generally than to drive it, and that it invariably starts much harder than a wire nail. Third, the work in inch-pounds per nail required in driving cut nails is much more than that in driving wire nails. Fourth, the work in inch-pounds in pulling cut nails is about equal, sometimes less and sometimes greater, per nail, than that for pulling wire nails. Fifth, the maximum force per pound in driving or starting wire nails is more nearly equal to that of the cut nails than when estimated on the basis of that of a single nail, but it is still less. Sixth, the work, in foot-pounds, per pound of wire nails required for driving is less than that required for the cut nail, and that for pulling is considerably more. Seventh, the relative efficiency which is here considered as the ratio of the work of pulling to that of driving is much higher for the wire nail than for the cut nail. In making experiments it was noticed that the cut nail bruised and broke the fibers of the wood, principally at the end of the nail, whereas the wire nail simply crowded them apart, and probably did not move them much beyond the point from which they would return by elastic force, and hence the nail would be grasped much stronger per unit of area of surface by the wood. Presenting less surface, there would be, however, less resistance to starting. To see what the effect of change of form would be, a number of ten penny cut nails were sharpened on the point by grinding to an angle of about 30 deg., so that the fibers in advance of the nail would be thrust aside and not bruised and broken. This served to increase the holding power over the cut nail of ordinary shape about 50 per cent, in starting force, and about 30 per cent in work of resistance to pulling.

AN ADJUSTABLE PIPE-BENDING DEVICE.

The pipe-bending apparatus shown in the illustration, which can be adjusted to vary the radius of the curve to be bent, is so simple that any workman could make one like it, says a correspondent of the Engineer's Review.

To the plate, C, is fastened a stud, B,



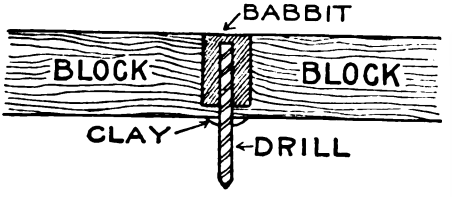
Adjustable Pipe Bending Device

while the stud, A, moves in a slot in the plate. The pipe is bent between these two studs, by prying in the direction in which the pipe is to be bent. The movable stud regulates the radius of the curve. The rib, D, is for holding the plate in the vise while bending pipe.

SHOP NOTES

HOW TO REPAIR A BROKEN DRILL

Procure a block of wood a little thicker than the length of the shank of the drill and bore a hole of the same size as the shank nearly through it. Bore through the rest of the way with a bit the size of the drill. Insert the drill in the hole as shown



Repairing the Drill

in the illustration and press clay or putty around it in the small hole from the underside. Run babbit in the chamber made in the block, allow it to cool, and then burst the block apart and the repaired drill is ready for use. It will bear much longer service than may be imagined and the repair will be found useful when the supply of drills fails unexpectedly.—Contributed by Eli Tolliver, Louisville, Ill.

THE STEAM BLAST AS A PROTECTION FOR THE BRIDGE WALL?

A steam blast introduced under a grate would do more harm than good, says a correspondent of Power, and where it is desirable to increase the draft, a blower set is the proper innovation.

The illustration shows the probable effect, if a steam pipe were placed below the grate

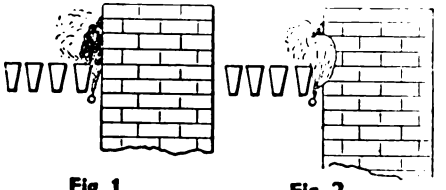


Fig. 1 Fig. 2

as in Fig. 1. The shaded portion represents clinkers adhering to the bridge wall In dislodging the clinkers, the steam would take with it a small part of the wall until an effect as in Fig. 2 would gradually

HOW TO MAKE AN AIR-HAMMER

An air-hammer, such as shown in the illustration, will be found handy for straightening round and flat iron at the scrap pile and may be home-made, says the American Blacksmith.

The anvil of the hammer is a cast iron block and the hammer is made of an 8-in.

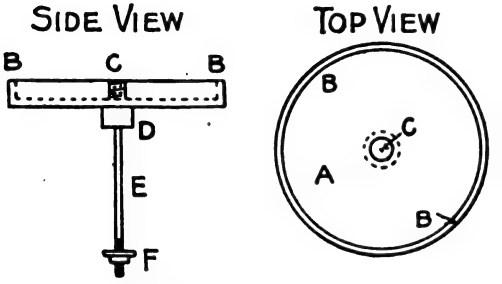
Air-Hammer for Straightening Scrap Iron.

railroad air brake cylinder. In the one shown, an old mortising machine was used for the frame, but it could be made of old channel irons, or a wooden post could be used. A foot treadle connected to the valve on the top of the cylinder by a rod operates the hammer and both hands of the operator are left free to handle the rods to be straightened. All round stuff up to 1¼-in. diameter may be straightened by this device. Of course the machine is usable only in shops having compressed air.

Contributions to this department are in-

FIXTURE FOR A DRILL PRESS

A simple, cheap and efficient fixture for a drill press is shown in the accompanying illustrations. It consists of a casting, A, with a flange, BB, a lug, D, to fit the center hole of the drill press table and a stud, C, the same size as the lathe spindle nose.



Fixture for the Drill Press.

In using, the fixture is placed on the drill press table with the boss, D, in the central hole. The fixture is then securely fastened by means of the washer and nut, F, on the rod, E. An universal or scroll chuck from a lathe is then screwed on the stud, C. This chuck is supported by the flange, BB.

The idea may not be new but it is a good one. By the use of the fixture much work can be done on the drill press by a cheap man that would ordinarily require a good man on the more expensive lathe.—Contributed by E. M. Davids, 958 Grand View St., Los Angeles, Cal.

HOW TO BRAZE A BROKEN GLAND

A gland which suffered injuries that broke off about two-fifths of the flange and took out one of the three stud holes in the gland, was repaired by a correspondent of the Engineer's Review in the following manner:

A piece of ⅛-in. sheet iron, the size of the gland and having a hole for the rod to fit, was cut out as in Fig. 1. In both flange and sheet-iron piece five small holes, less than ¼ in. were drilled to correspond, and the plate was riveted to the gland. A charcoal fire was then built in the forge, and the gland, flange downward, slowly heated till red hot, when borax was poured over the fracture until sufficient to flow into all the crevices. Bits of brass were then placed along the line of fracture, enough to fill all space between the plate and the gland, Fig. 2, and in the crack in the flange, also. The part was then heated until the brass flowed freely into the joint when it was removed from the fire and allowed to cool. The stud holes were then bored and the piece dressed off. This repair was made in 1882 and two years ago was still in good order.

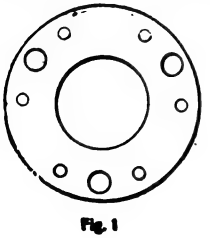


Fig. 1

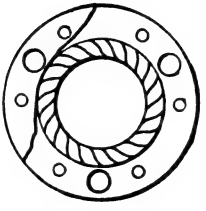


Fig. 2

COLORING CONCRETE

[Excerpts from paper by J. P. Sherer read before the convention of the National Association of Cement Users.]

All coloring compounds containing acids or greases (including lamp blacks and graphites), are detrimental to concrete. For this purpose ground colored natural stone and mineral iron oxide are most desirable, in that they do not weaken or damage the setting qualities of the stone, but add materially to the strength of the finished product.

It is more satisfactory and cheaper to color the entire block than to use the facing plan. The color of the mixture wet must be many shades darker than the shade it is desired to obtain. For a strong deep cherry red from five to seven pounds of pure mineral oxide per cubic foot of concrete should be used.

TEMPERING STOUT SPRINGS

The following method may be used on springs for almost any purpose with excellent results:

Smear the spring with oil or tallow and hold it over a clear fire, or in a hollow fire, or place in a large iron pipe and put in the midst of the fuel of an open fire. Heat the spring until the grease burns off with a blaze. Probably the ends of the spring will heat first and the grease begin to burn there. If so, remove from the fire the moment this happens and immerse in oil, but do not quench entirely. Remove from oil and reheat, and if the ends again heat first, immerse in oil again. Repeat this operation until the oil burns uniformly on all parts of the spring. Cool by whirling around in the air.

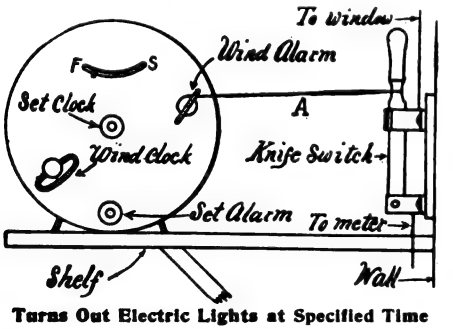
INSPECT THE SHAFTING AND SAVE POWER

Shafting which is out of alignment, belts which are too tight and bearings which are improperly fitted or insecurely supported are all excellent means of wasting power, says the Practical Engineer. Regular inspections of couplings and shaftings will pay for themselves in the power saved and the reduced expense in generating power. Pulleys placed too far from the shaft hangers spring the shaft, thus wasting power and perhaps heating the journals. Small pulleys waste power also, as they necessitate straining the belt too tightly.

AUTOMATIC DEVICE FOR TURNING OUT ELECTRIC LIGHTS

Merchants will find convenient a device which will automatically turn out the electric lights in their show windows some hours after they have left their places of business.

Such a device is shown in the sketch and may be rigged up accordingly. An alarm clock and a knife switch are the essential parts required. A in the diagram is a string having one end tied around the switch and the other end tied to the alarm winding key on the clock which has the bell removed. When the alarm rings, the string winds up, thus pulling out the switch and



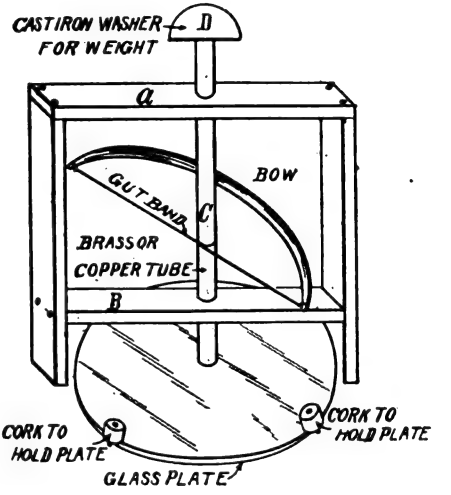
Turns Out Electric Lights at Specified Time

so breaking the circuit. If a merchant leaves his store at eight o'clock and wishes the lights turned off at twelve, he just sets the alarm for twelve o'clock and winds it up, closes the knife switch and may go home assured that exactly on the hour the lights will be turned off.—Contributed by G. Russell Noble, South Haven, Mich.

METHOD OF DRILLING HOLES IN GLASS PLATES

The apparatus shown in the illustration is used for drilling holes in glass plates such as are used in static machines. The frame is very easily made and the sketch explains its construction.

Procure a copper or brass tube the size of the hole it is desired to drill in the glass,



Drilling Holes in Glass Plates

and bore holes in the crosspieces, A and B, just large enough for the metal tube to pass through and have room to turn freely. If these holes are too large, the hole drilled in the glass will not be round, nor of the size desired; if too small, the tube will not turn freely.

Make a bow, such as a boy uses for shooting arrows. Pass the tube through the hole in the upper crosspiece of the frame and make one turn around the tube with the string of the bow, as at C. Then pass the tube on through the hole in the other crosspiece. Fasten a weight on the top of the tube as at D, and the apparatus is ready for use.

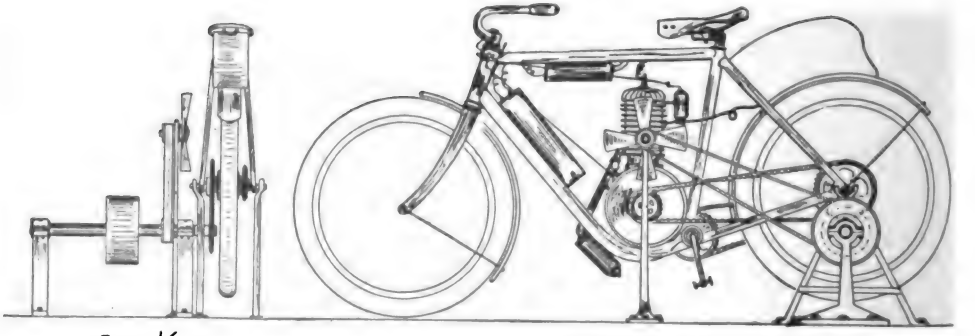
Fasten the frame on a perfectly flat table, put the glass plate under the framework and fasten it down with nails driven through corks. Put a small quantity of emery dust moistened well with turpentine into the tube and, grasping the bow, saw back and forth, so causing the tube to revolve alternately toward the right and left. In a short time a clean round hole in the glass plate will result.—Contributed by W. J. Slattery, Emsworth, Pa.

CEMENT FOR SLICKING LEATHER FILLET ON BRASS PATTERNS

Melt together 2 parts rosin and 8 parts pure beeswax, let cool, cut into strips, and apply with a slicking tool of the proper radius. The best tool for the purpose is made by setting a piece of wire into a steel ball and heating over a Bunsen burner. In applying, warm the pattern slightly so the cement will flow between the leather and brass. When cold any excess cement may be removed with a piece of waste soaked in spirits of turpentine.

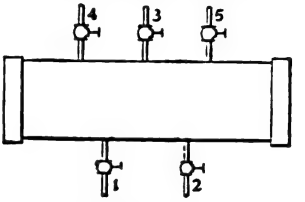
MOTORCYCLE FOR SHOP POWER

In one of your "shop notes" in the May number I notice the article of using a motorcycle for shop labor by placing it on a stand and connecting the drive wheel to a shaft. I do not wish to criticise this article, as I think it very good, but merely offer a suggestion and enclose a drawing. It is a well known fact that a gas-engine heats up very rapidly to its own destruction unless cooled either by water or air cooling fins on the cylinder. For motorcycle use, the air-cooled is generally adopted because its rapid passage through the air causes the air to circulate freely around and through the fins, cooling the cylinder perfectly. Now, if the same machine is installed in a building on a stand where there is little or no moving air, it is clearly seen that the cylinder can not be cooled unless some device is used to produce an air current, such as a fan, as shown by my drawing. If this plan is used also, I see no reason why the use of a motorcycle for shop work should not be a success.—Contributed by Prentice P. Avery, Ridgewood, N. J.



DEVICE FOR TESTING VACUUM GAUGES

The illustration shows a device designed by a correspondent of Power for testing vacuum gauges. It consists of a piece of 4-in. pipe, capped at each end and tapped for five ¼-in. nipples as follows: No. 1, live steam inlet; No. 2, for the condensed drip; No. 3, high pressure gauge connection from which the high pressures may be tested;



Nos. 4 and 5, connections to the two vacuum gauges, one of which is a standard. In operation, steam is admitted through the live steam inlet till the high-pressure gauge registers 100 lbs. pressure, when the steam is turned off and cold water applied to the outside of the pipe. This condenses the steam and forms various amounts of vacuum. The gauge under test can be compared with the standard gauge, and corrections noted.

MAKING BLUEPRINTS FROM PENCILED DRAWINGS

Blueprints can be made from pencil drawings by using rapid blueprint paper, a pencil tracing and good sunlight, an exposure of one minute only being necessary, says a correspondent of the American Machinist, who recommends the method highly as simple and wholly efficient. The 2-H. grade of pencils is stated as the best for the purpose.

HOW TO BLUE GUN BARRELS

The gun barrel should first be cleaned free from grease, oil or varnish. Dissolve 4½ oz. hyosulphite of soda in 1 qt. water and make another solution by dissolving ¼ oz. acetate of lead in 1 qt. water. Mix the two solutions and heat to the boiling point in a porcelain dish or stone pot. Warm the cleaned gun barrel and, using a piece of sponge tied to a stick, smear it with the hot solution. When the color has developed, wash the gun barrel, wipe it dry, and finish with boiled linseed oil.

HOW TO KEEP SMALL DRILLS FROM BREAKING EASILY

Small drills will not break so easily, says a correspondent of Machinery, if at the section indicated in the illustration they are drawn to a straw color. This treatment reduces the brittleness of the drill at that point and makes it less liable to snap off in the hands of the men and boys, who are not always so particular about handling tools.

To Keep Small Drills From Breaking

TO MAKE DASH-POTS NOISELESS

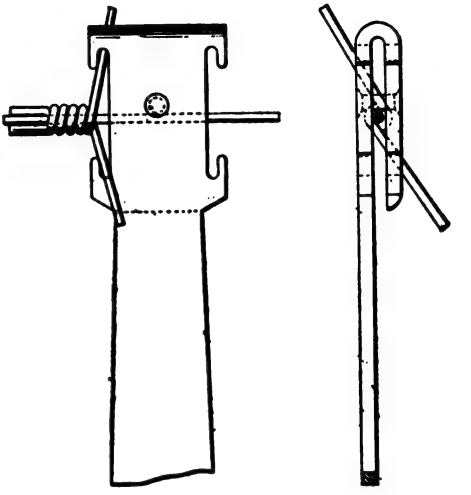
Engineers troubled with noisy dash-pots may profit by a kink practiced by a correspondent of Power, who says the dash-pots on an engine he was operating always slammed when brought home.

To prevent this he put a valve on the end of each of the pipes which are about 2 ft. long. He now leaves the regulating valves on the dash-pots open, and regulates by means of the valves in the pipes. The plungers are brought home as quickly as before and there is more air to act as a cushion and prevent the sound.

The same writer says that when an engine that is equipped with dash-pots of the leather-packed type is running and a dash-pot gets to bucking and water will not help it, it can be temporarily repaired by putting a check valve on the end of the pipe; this can be done without shutting down.

A HANDY WIRE-SPLICING TOOL

The illustration shows a wire splicing tool which will be found useful. The device is used in making a three-wire connection.—Contributed by W. H. Cunard, Everett, Pa.

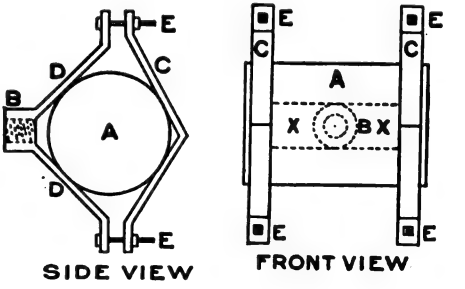


Three-Wire Splice

JIG FOR BORING WRIST-PIN HOLE IN GASOLINE PISTON

The parts of this jig or fixture are as follows: B is a boss threaded to fit the lathe nose; DD are cast on to the ends of X; CC are clamps secured by bolts EE.

In using, the fixture is screwed on the lathe spindle, when the trunk piston, A, may be very easily set in position for boring the wrist-pin hole. Many sizes of pistons may be machined by the use of one of these jigs, and when well made, they produce very accurate work.—Contributed by E. M. Davids, Los Angeles, Cal.



USEFUL ARTICLES MADE OF WROUGHT-IRON PIPE

Pipe and fittings can often be used to advantage by the tradesman in constructing articles needed about his work which must be both light and strong, says the Metal Worker. Nearly every workman can construct these various articles according to his individual requirements and perhaps improve upon them. Those shown here are in the nature of suggestions of the adaptability of the material.

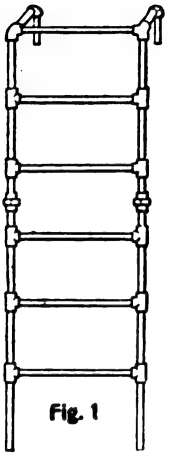


Fig. 1

A short ladder made of ¾-in. iron pipe, connected by T's, elbows and unions is shown in Fig. 1. The ladder is so constructed that it can readily be taken through small places, as to inspect tanks in attics, or conveying in a vehicle, such as an open buggy, the unions being placed in the middle. It has hooks on the top so that it may be hooked over the side of a tank.

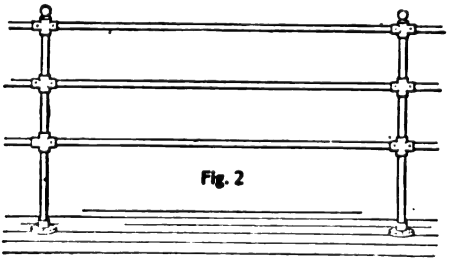


Fig. 2

The railing shown in Fig. 2 is made of 1¼-in. pipe. Special railing fittings are used in screwing up the vertical posts with threads and the side rods are connected by rivets. A post is held to the floor by one-half of a flange union and an ornamental cap surmounts the top of each post. The railing is both substantial and neat and may be changed and adapted to almost any requirement.

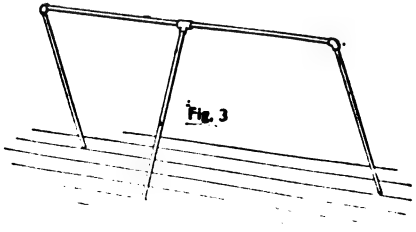


Fig. 3

Five pieces of ½-in. pipe, two elbows and a T were used to make the horse for a drafting table shown at Fig. 3. The device is light and adjustment is made by moving the middle leg backward or forward. It may be taken apart and set up at another point, if desired at any time.

HOW TO TELL STEEL PIPE FROM IRON PIPE

It is so often difficult for users of pipe to distinguish iron pipe from steel that a few hints on the subject may be found helpful. The scale on steel pipe is very light and has the appearance of small blisters or bubbles; the surface underneath being smooth and rather white; on iron pipe the scale is heavy and rough. Steel pipe seldom breaks when flattened, but when it does break the grain is very fine; whereas the fiber of iron is long and when the pipe breaks, as it readily does in the flattening test, the fracture is rough. Steel pipe is soft and tough, says Domestic Engineering, and when it is threaded, the threads do not break, but tear off. It requires very sharp dies to cut the threads on steel pipe successfully, and a blunt die which might be used with satisfactory results on iron pipe, will tear the threads on steel pipe, because of the softness of the metal.

DETERIORATION IN GRATES

The principal cause which contributes to the rapid burning out of the grate bars in a boiler is the action of the furnace heat, which will in time destroy any set of grates, but the want of a proper flow of air through the grates will cause overheating whether it occurs through too little air-space in the grates themselves, or by these spaces becoming obstructed through any cause, thus preventing the cooling effect of the air on its passage to the fire. Another reason is found in the impurities of the coal, and especially in the chemical combinations of sulphur and iron, which impurities are found in more or less quantity in all coals. The Practical Engineer says any coal which forms an easily fused clinker will injuriously affect the grates.

HOW TO REMOVE GALVANIZED COATING

The coating should be burned off, and if the galvanized parts are to be welded, the heat for welding can be obtained at the same time. Heat the pipe or iron to a white heat and use only plain, clean sand. After preparing one end for welding, says a correspondent of the American Blacksmith, plug the opposite end so as not to burn the pipe.

HOW TO MAKE A PORTABLE SCAFFOLD BRACKET

A pair of portable scaffold brackets which can easily be stored out of the way will be found a great convenience by the tradesman who only needs them occasionally and usually borrows them at such times of a carpenter. The bracket shown

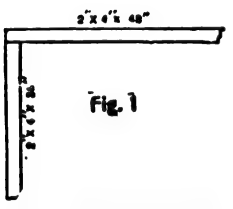


Fig. 1


Fig. 2

in the sketches takes but a few hours' work to construct and may be readily set up on the work, says the Metal Worker.

To make the bracket use a 2x4 stick 36 in. long for the upright, and for the bracket a 2x4 stick 48 in. long. Place the longer piece on top of the shorter, as in Fig. 1, and spike them together with two 20-penny nails, driving the nails in as near

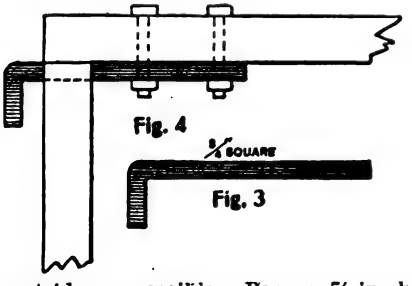


Fig. 4

Fig. 3

the outside as possible. Bore a ⅞-in. hole in the short piece, directly under the top piece, as in Fig. 2, and pass an iron hook, Fig. 3, through the hole. The hook should be made of ¾-in. bar iron, 9 in. long and drilled for two ⅜-in. bolts. Make the hook part 2 in. long and bolt it directly to the top bracket, as shown in Fig. 4, allowing the hook part to extend about an inch from the back. With 10-penny nails attach 1x6-in. diagonal pieces near both ends of the

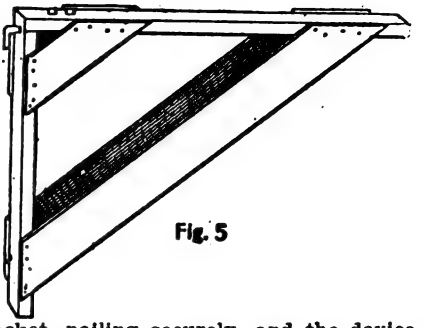


Fig. 5

bracket, nailing securely, and the device is then complete, as in Fig. 5.

In fastening the bracket on a building, cut a hole 1 in. wide and 3 in. high into the sheathing close to the stud. The bracket can be unhooked easily from this position. The device will be found both cheap and light and also a time-saver.

KEEP OIL OUT OF BOILERS AND FEED WATER HEATERS

Many boiler experts insist that oil or grease inside a boiler or heating surface is far worse than the ordinary scale deposited from the water, in cutting off heat from the water and overheating the boiler plate.

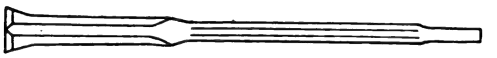
Tests have been made to show this, says a writer in Page's Weekly. When the temperature of the water was made to rise rapidly in a clean boiler, the difference in temperature between the boiler plate and the water did not increase at the same rate, showing that the heat passed through the water nearly as fast as received. With a very high evaporation of steam per hour in a clean boiler there was little danger of overheating the metal. But covering the inner surface of the metal with a thin layer of heavy mineral oil and evaporating about as much steam as in the first place, the fire side of the boiler plate was 392° hotter than the water side. The plate itself must have stood a temperature of about 630° F., at which iron and mild steel weaken and are easily broken. Any flaw in the plate would of course add to the danger.

Hence for safety and economy, when exhaust steam is mixed with the feed water, use feed water heaters in which the steam is on one side of the tubes and the water to be heated on the other, if possible.

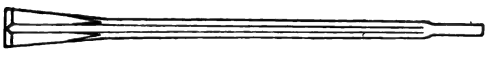
DRILLS SHARPENED BY POWER MACHINES

Cost of Sharpening Greatly Reduced- No Longer Necessary to Upset a Half-Foot of Stock.

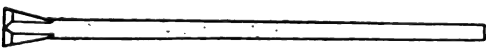
The sharpening of drills by machine is rapidly superseding the old practice of sharpening by hand, not merely because it is easier, but because of the great economy thereby effected. Various methods of sharpening were formerly in use in mines, says T. H. Proske, in the Mining and Scientific Press, and all were laborious and expensive. Usually the cross bit, which took the place of the single bit in the modern air drill from the first, was upset to twice its normal size for from 6 to 8 in. at one end in order to



Type of drill used in Rocky mountain mining districts. Cross-formed bar welded onto octagon bar; shank forged to small bushing.



Type of drill used in Michigan copper and iron mines. Long cross upset in bolt upsetting machine from octagon bar.



Type of drill as made with a Power Drill Sharpener. Cross upset 3 inches long from round bar; no forging down of shank, as chuck bushing is large enough to take the full size of bar; the most economical drill that can be made.

have a long stock to use in redressing the bit. When this upset portion was worked down, the bar was again upset.

In some Michigan mines a bolt-upsetting machine was installed to do this upsetting, but the expense was prohibitive of this practice becoming general. Then steel-makers began to manufacture cross-formed bars of steel which were cut into the required lengths to be welded in the bars. This practice is general in Rocky mountain mining districts, and while somewhat cheaper, is still expensive.

Until the advent of power drill sharpening machines it is said that no two mines used the same kind of drill. There was no economy in the gauge used. Often the starter drill would be 3½ in. wide and drop ¼ in. in gauge for each successive length. Out of this chaos the machine method brought system. It was determined that for 1¼ in. powder, a 1 7-16 in. hole at the bottom is sufficiently large; that the strength of the powder can be increased more cheaply than the size of the hole, and that the gauge should not vary more than ⅛ in. Supposing a 9-ft. hole were to be put down with four lengths of drills, the sizes would be as follows: Starter, 1¾ in. wide; successive lengths, 1⅝ in., 1½ in., and 1⅜ in. wide, respectively.

A 3-in. cross is sufficient where the machine is used and the sharpener will forge the cross and bit on the end of the bar without hand labor. One man using such a machine can sharpen from 200 to 300 per cent more drills than he can sharpen by hand.

SOME GOOD RECIPES FOR CEMENT FOR LEATHER BELTS

(1) Soften equal parts of good hide glue and American isinglass in water for 10 hours. Then boil it with pure tannin until the mass is sticky. Roughen the surface of the belt joints and apply the cement hot.

(2) Digest 1 kg. of finely shredded gutta percha over a water bath with 10 kg. benzol until thoroughly dissolved, then stir in 2 kg. of linseed oil varnish.

(3) Dissolve completely 1½ kg. finely shredded india rubber in 10 kg. of carbon bisulphide by heating and while still hot add 1 kg. shellac and 1 kg. turpentine. Heat again until the last two ingredients are dissolved.

(4) Dissolve at a moderate heat 1 kg. best glue in 1½ kg. of water and thicken to the consistency of syrup. While this mass is hot stir in 100 gm. of thick turpentine and 5 gr. carbolic acid. Pour the mixture into flat tin pans to cool; cut it into pieces and dry it in the air. To use, make the cement liquid with a little vinegar, apply to the joint with a brush; place the two ends of the joint together and press between two iron plates heated to a temperature of 86° F.

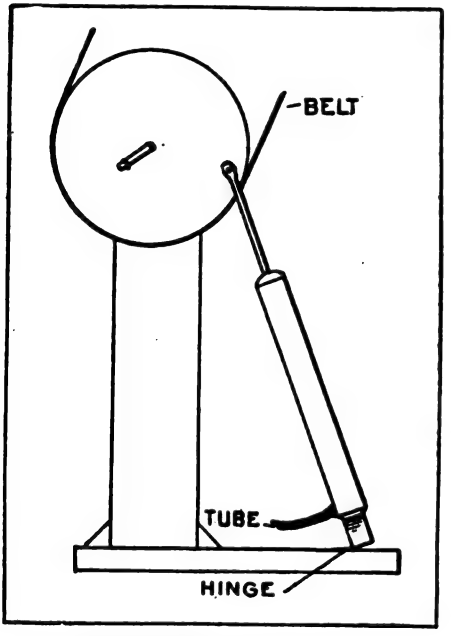
PAINTED PAPER FOR STEEL

Steel surfaces may be protected with excellent results by covering them with painted paper. The method employed is to first clean the steel in the ordinary way and then put on a single coat of a very sticky substance, upon which paraffined paper is next laid. Any color paint desired may be used for painting over the paper. Holes cut in the paper allow the rivet heads to pass through and the heads are then covered with caps of the paper and painted also.

HOW TO MAKE A SMALL AIR COMPRESSOR

Anyone possessing, or able to obtain an old bicycle pump can, without much difficulty, make a small air compressor which will pump a bicycle tire or run a toy steam engine. The next thing necessary is a pulley about 8 or 9 in. in diameter and 2 in. thick.

Mount this pulley on a piece of ¼- or ½-in. steel rod for a shaft. Bend about 2 in. of one end of the shaft at a right angle and force the rod through a hole in the center



Air Compressor Made of a Bicycle Pump.

of the pulley, hammer it into the wood and fasten it with a staple.

Remove the handle from the bicycle pump, heat the end of the piston rod to a bright glow and hammer it flat. Drill a hole in the flat part large enough for a nail to pass through easily. To the foot-piece on the bottom of the pump solder a hinge and then screw the loose part of the hinge to the baseboard which is constructed as shown in the illustration.

In putting the compressor together mount the shaft of the pulley on pieces of sheet brass having holes drilled to make an easy fit. These pieces of sheet brass should be screwed fast in a hole in one end of a 2 x 4 in. timber 2 ft. long. Nail the end of the piston rod, through the hole drilled, to the pulley and belt whatever means of generating power you may have to the air compressor which is now complete. A small electric motor will work the apparatus nicely for pumping bicycle tires or other work of that nature.—Contributed by E. H. Klipstein, East Orange, New Jersey.

CASTING ALUMINUM FOR PATTERN WORK

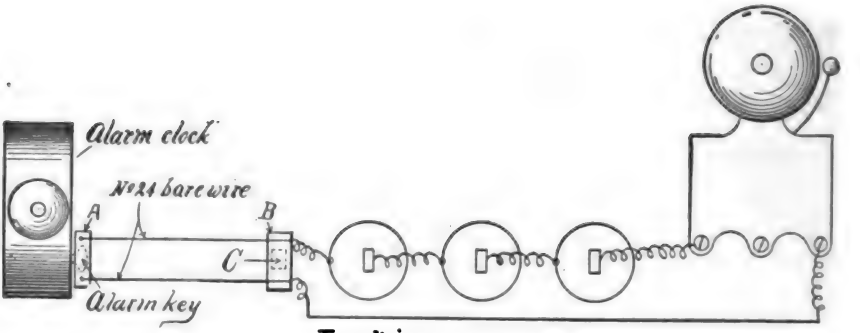
Casting aluminum for pattern work is a matter that is constantly assuming greater importance, says the Mechanical World, and there is a demand for general information on the subject. It is important to make the mould suited to the casting. For instance, a plain bar can be molded up as hard as may be, and if well vented, will come out perfect. On the other hand, a thin ring, unless molded up soft enough to allow the metal to compress it, will be sure to tear apart. Hence, wherever the metal is to inclose the sand, this must be left as soft as possible, to allow for compression during the cooling of the casting. Ram the sand as little as possible, use as dry as possible, vent freely, and you are pretty safe. Aluminum is quite brittle at the critical temperature, hence the least strain at that time injures it. Cores should be soft, and coated with graphite. The sand should be new, and while no facing is necessary, a good dusting with soapstone can be recommended. The slicking tool should never be used on a mold.

Melt the aluminum in a plumbago crucible, previously rubbed up with graphite. When the metal is melted, it should be poured at once. Gates should be wide, and of a generous area. Big feeder heads are not advisable, as they do not feed, but rather draw away the metal from the casting. The metal should not be too hot, a good claret color is sufficient, when observed by putting aside the skin with a stick. Fluxes are unnecessary; occasionally, however, cryolite may be used to advantage. All sodium salts should be kept away. Zinc can be added, though the metal should not be sold as an aluminum casting. Up to 15 per cent can be used safely. Tin also should not be added to the aluminum.

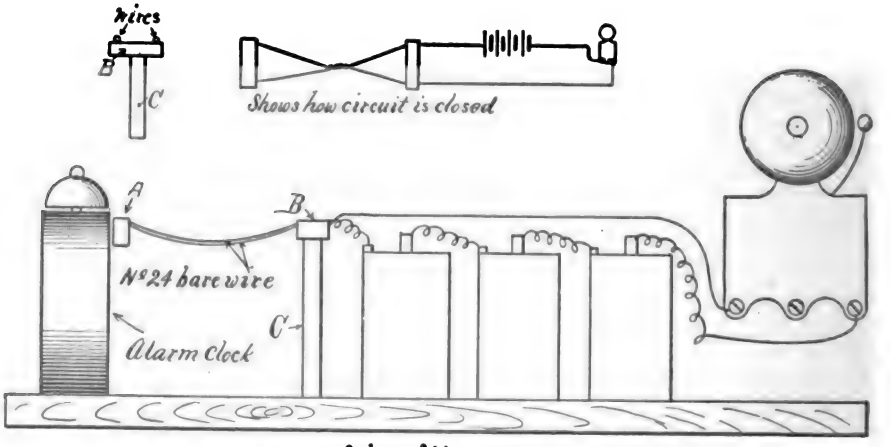
Bristles may be stiffened by immersing them in cold alum water for a short time.

HOW TO MAKE AN ELECTRIC ALARM ATTACHMENT FOR AN ALARM CLOCK

Make a baseboard for this device about 10 in. long by 6 in. wide at the center, with an upright C, extending upward to about the height of the alarm key of the clock.



Top View



Side View

On top of the upright fasten a small piece of wood to form a T, and fasten a similar piece on the alarm key, as at A in the sketch. Connect these two pieces A and B with two pieces of No. 24 bare copper wire and carry the wires on to form connections, one going through the batteries to one terminal of the bell, and the other passing directly to the other terminal.

The apparatus will then be in working order. Set the alarm in the usual way. When it goes off, the turning key will twist the two bare wires together forming a circuit which will set the electric bell ringing. The wires will untwist when the alarm is again wound up, and the electric bell will ring until this operation is performed.—Contributed by W. J. Slattery, Emsworth, Pa.

CEMENT FOR STEAM PIPES

Rub as fine as possible, litharge, 2 parts; powdered slaked lime, 2 parts; sand, 1 part. Mix the mass with a sufficient quantity of hot linseed-oil varnish to form a stiff paste. Use the cement while fresh and warm.—Contributed by R. Lindemann, Boulder, Colo.

HOW TO FILTER WATER FROM GASOLINE

Fine wire gauze will not remove water, but if a chamois skin pocket be carried by a gauze on either side and placed between the gasoline tank and the carburetter, all dirt and water will be removed, says the Motor

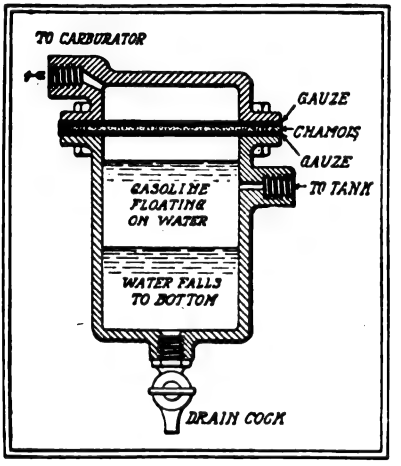


Fig. 1.

Age. The arrangement should be on the order of the device shown in Fig. 1, so that the water may settle into a separator, and be drained off. The separator should be about 4 in. long and 2 in. in diameter. If this is drained each day no water will reach the carburetter unless the chamber becomes filled, which could only be occasioned by rain entering the fuel tank as the gasoline itself of a day's usage would not contain that quantity. The strainer placed between the tank and the carburetter is better than one placed at the tank, for the reason that in the latter dirt and water would be forced through the tank strainers by the impact and weight of the fuel entering, while in a strainer placed between the tank and the carburetter the fuel is strained slowly, in fact as slowly as it is used. A first-class water separating strainer is shown in Fig. 2. At the bottom of the separating chamber is a needle valve. On this valve is a metallic float of such a weight as to sink in gasoline and just float in water. When the chamber is filled with gasoline the valve is seated, but as soon as water collects the float is lifted, opening the valve and letting the water flow out until the gasoline comes to such a level that the valve seats. The device has the gauze and chamois strainer.

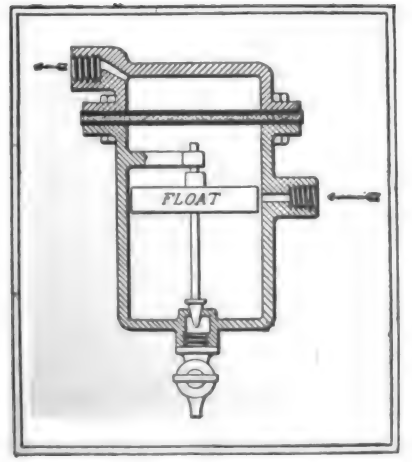
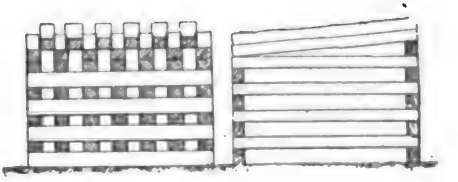


Fig. 2.

HOW TO PILE RAILROAD TIES

The proper method of piling railroad ties is shown in the accompanying illustration. Each pile contains either 25 or 50 ties built up in alternate courses of two and seven.



The Way to Pile Railroad Ties

Two ties are first laid on the ground some distance apart, then seven others are placed across these and so on to the top, where the last course is laid to form a watershed.

HEAT-RESISTING CEMENTS

1. For cementing joints. Make into a thick paste, asbestos powder and liquid silicate of soda. This cement will withstand a very high temperature.

2. For stoves and ranges. Use fire clay and a solution of silicate of soda.

3. The following cement will resist white heat: Pulverized clay, 4 parts; plumbago, 2 parts; iron filings, free from oxide, 2 parts; peroxide of manganese, 1 part; borax, ½ part; sea-salt, ½ part; mix with water to a thick paste and use immediately. Heat gradually till it comes nearly to a white heat. This cement is recommended by the Monumental News.

HOW TO PAINT CEMENT FLOORS

In order to roughen the surface of the floor so that the paint will hold on well and also to change any caustic lime contained in the cement into harmless sulphate of lime, the floor should first be treated with a wash. If it is only a few months old, a wash consisting of 12 fluid ounces of vitriol and one gallon of water mixed in an earthen or glass vessel, allowed to cool, and then applied with a large fiber brush or a swab made of cotton waste, will produce the desired results.

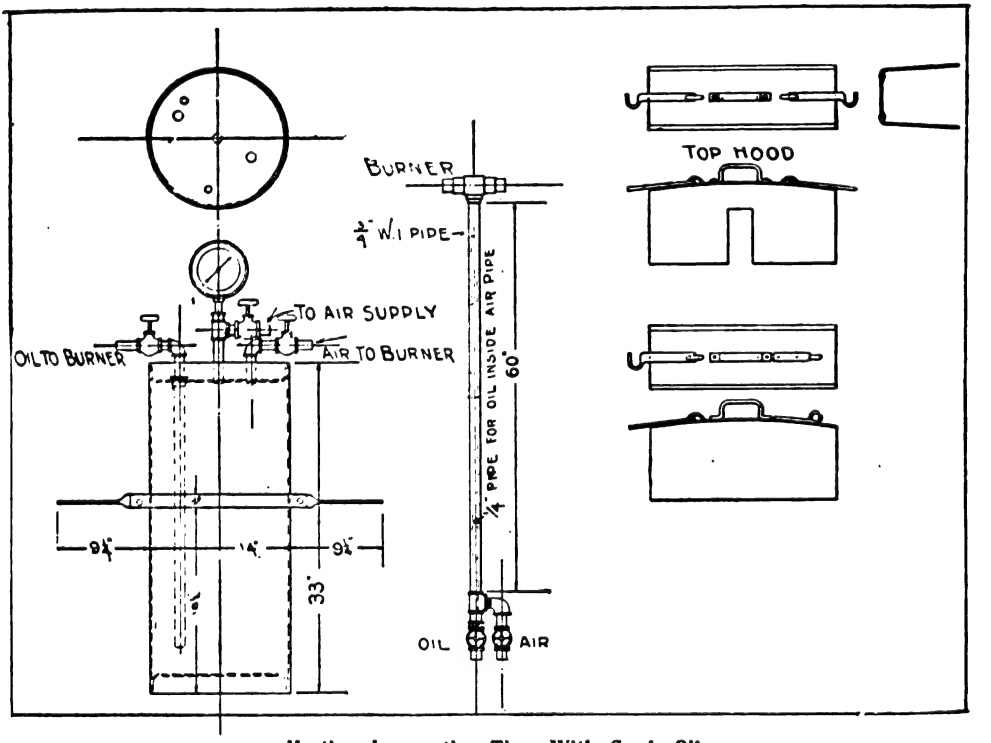
After the wash has been on 24 hours apply a priming of well-settled and well-aged raw linseed oil and let stand for a week. Then apply a coat of good linseed oil paint, preferably with a pure lead and zinc base. Rub in well and finish with a hard drying floor paint of the grade used on ferry boats, says the Painters' Magazine, and adds:

"If such a floor paint is to be of lead color or spruce color, it is best made on a base of equal parts of lead and zinc in oil, thinned with equal parts of turpentine and japan to brushing consistency, tinted to suit requirements, and then mixed equal parts by measure with hard drying floor varnish of approved quality."

On cement floors thus treated the paint will wear well even in engine rooms and machine shops where oil is apt to be spilled over it.

HEATING TIRES WITH CRUDE OIL

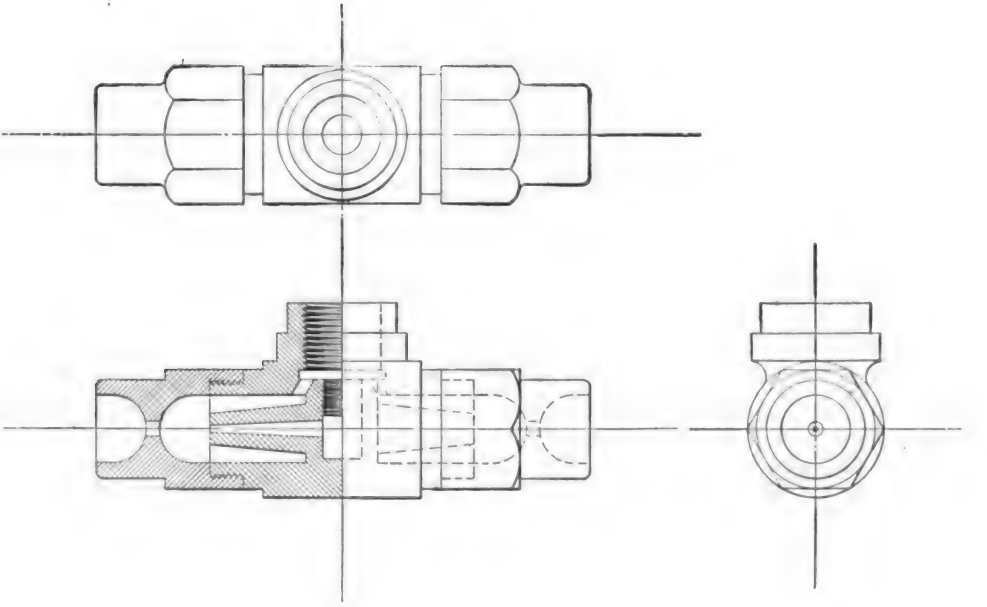
The illustration shows an apparatus used for heating locomotive tires with crude oil as a fuel. With this process it takes only about six minutes to heat one tire, about two gallons of oil being used.



Heating Locomotive Tires With Crude Oil

The method of using the apparatus is very simple. If a tire is to be heated, the wheel is jacked up for several inches off the ground, then the sheet metal hoods are placed all the way around the tire, leaving but a small space at the bottom for the burner to be inserted. A piece of lighted waste is then placed directly in front of the burner and the oil and air turned on, the amount of each being determined by the operator.

The construction of this device is both cheap and simple. For the oil tank an old air-drum off a locomotive may be used.



Detail of Oil Burner for Heating Tires

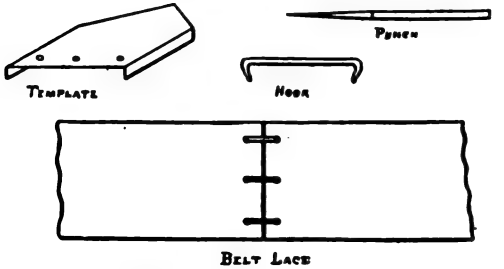
The burner is connected to the tank by two hose pipes each about 30 ft. long. Only about 60 to 80 lb. air pressure is required to operate the burner.

This tire heater is in use in several railroad shops about the country and has proved very satisfactory as a quick and cheap method of removing and setting tires. —Contributed by G. E. Baldwin, 634 D St., San Bernardino, Cal.

HOW TO MAKE A CANVAS BELT JOINT

In rooms where there is so much dampness and steam that rubber belts are affected thereby and come off, canvas belts can be substituted and will be found to work very well, says the Practical Engineer.

These belts may be mended in the following manner: Place a tin template, having holes the right distance from the sides and ends, on the end of the belt, square it off, mark the holes and punch them with a long pin having a tapered point. This pin is better than a belt punch, as the punch cuts away and weakens the belt and the hook will pull out. Use a hook with a good, and quick point. It is a good idea to keep templates for different-sized belts on hand. The wide ones should have more holes.



Making a Canvas Belt Joint

SUBSTITUTE FOR PURPLE LAKE

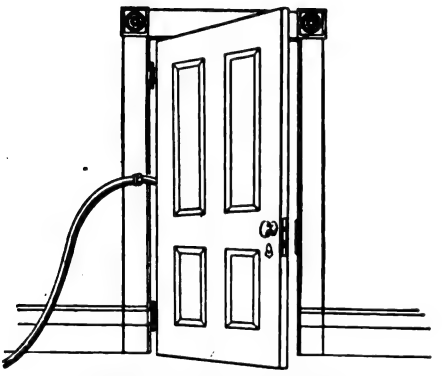
Purple paint is so rarely used that it does not pay the average painter to buy a can of purple lake when he needs but a little. If he will add just a touch of ultramarine or cobalt to his carmine and glaze as for carmine, or, add a touch of Prussian blue to the ground and glaze with clear carmine, the results will be satisfactory.—From John L. Whiting & Son's Book, "What Else to Do."

The amount of Portland cement used in this country doubles about once in four years. Last year it amounted to more than 23,000,000 bbls.

MADE A VISE OF A DOOR

When a vise is not handy, and one is not strong enough to hold the work with his hands, the following kink may be found useful:

A gardener who was repairing a lot of old hose and whose only suitable tool was a



Utilizing the Door as a Vise

wrench, could not get the old couplings apart. He asked me to hold it for him, but I could not. Instead, I opened the barn door and through the crack between the door and the side of the casement on which it was hung pushed a piece of hose up to the coupling. Then pushed the door to, and while the gardener held it, I unscrewed the nut by means of the wrench. There are many articles that could be held in this manner.—Contributed by Thiede of Colorado.

HOME-MADE CROSSHEAD PIN OILER

A very satisfactory crosshead pin oiler may be made like the one shown in the illustration. A correspondent of the National Engineer says he applied such an one to a vertical engine several years ago and it is still doing good work.

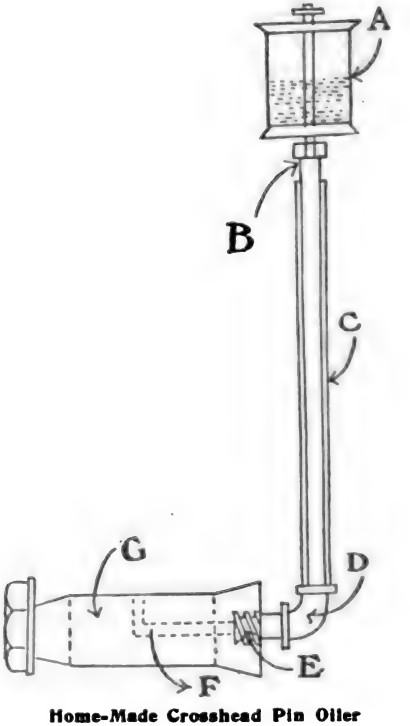
The device consists of an oil cup, A; a piece of ⅛-in. pipe, B; a piece of ⅜-in. pipe, C; and a ⅜-in, elbow and nipple D. The outer end (E) of the pin is tapped with a ⅜-in. pipe thread, and the oil duct is drilled as shown at F.

The cup is stationary and is fastened to the front of the cylinder or engine frame by a bracket over the center of the elbow D. The shank of the cup is drilled and tapped for ⅛-in. pipe, into which is screwed the pipe B, which telescopes the ⅜-in. pipe C.

To determine the height at which to place the cup, place the engine on upper center (vertical engine) and place the end of shank of cup the length of the engine stroke, plus at least 2 in. above the face of elbow D.

To determine the length of the ⅛-in. pipe, place engine on upper center and cut pipe long enough to reach within ½-in. of shank of cup, when screwed into elbow D. The center of the elbow D must be plumb under the center of the cup A, thereby allowing pipe C to travel up and down outside of pipe B without touching it at any point.

Only one oilway should be cut in the top



Home-Made Crosshead Pin Oiler

crosshead pin brass and it should extend lengthwise to within an eighth of an inch of each end. Always have the oil duct at the top of the pin, and always be careful not to turn the pin while tightening the nut, if there is no means provided for holding it in position.

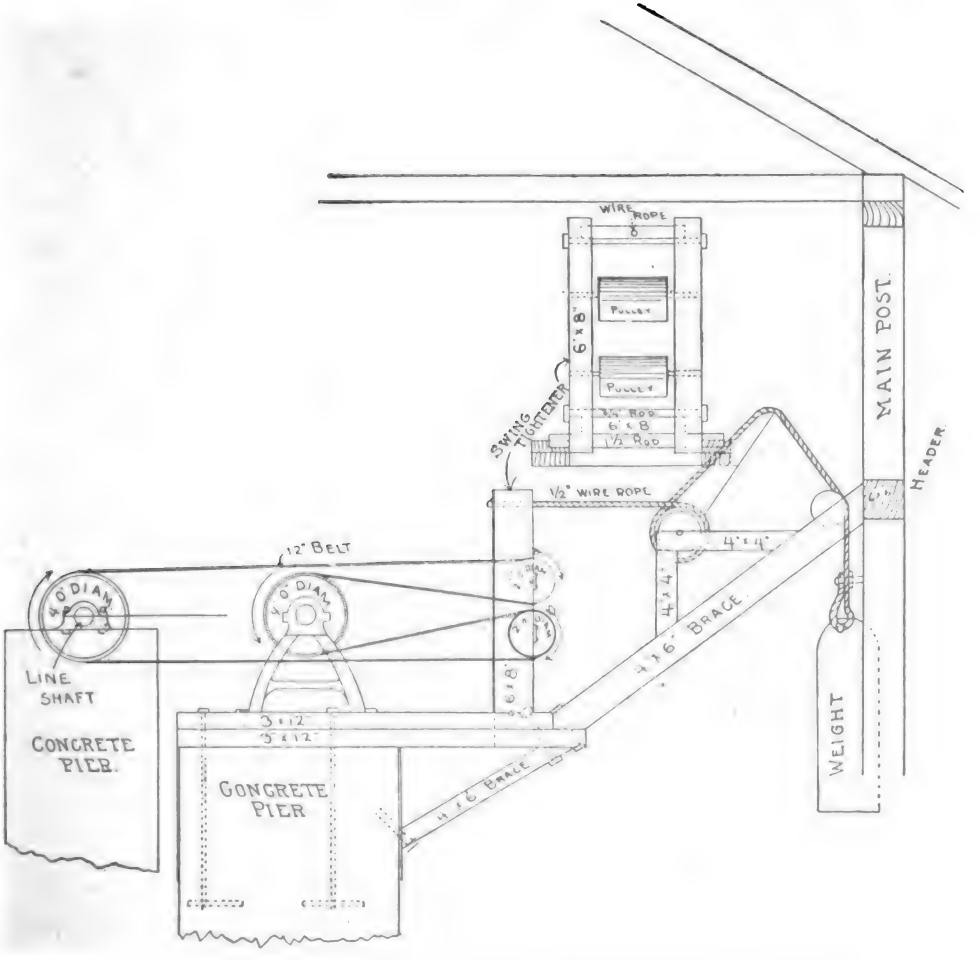
Castor oil is an excellent preservative for leather belts and rats will never touch belts treated with it. Apply the oil warm.

A POWER TRANSMISSION KINK

The accompanying diagram is a plan submitted by C. J. Case, of Johnsonburg, Pa., showing how he succeeded in running a machine requiring 40 hp. in the opposite direction from the line shaft, without crossing the belting. The back of the belt runs on the driven pulley. The speed maintained was 193 r. p. m. The direction in which each pulley revolved is indicated by arrows.

WRITING DETAILS ON BLUEPRINTS

A solution of 75 gr. of potassium oxalate dissolved in one ounce of water is excellent for writing details on blueprints. The fluid should be applied with a pen or fine brush, and may be thickened with gum, if necessary. It removes the blue ground of the drawing very rapidly, but the paper should be washed well afterwards or the blue will reappear, and the writing become obscured.



Running a Machine the Opposite from Line Shaft Without Crossing the Belt

TO EMPTY GASOLINE FROM BARRELS

The best method is to syphon the gasoline out with a rubber hose. says a correspondent of the Engineers' Review. To start the flow of the gasoline, pass a string a few inches longer than the hose through the hose by means of a plumnet tied to one end. To the other end tie a bunch of rags. Push these into the end of the hose, poke the hose rag end first into the barrel to its lowest point, hold the hose in place with one hand and pull on the string with the other. When the rags come out, the gasoline will follow.

How to Make a Portable Electric Heater

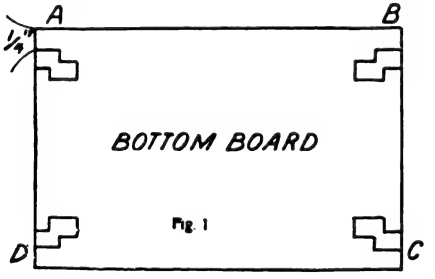
By Harry H. Townsend.

Anyone can make the portable electric heater described below, without the use of an ohmmeter or the necessary apparatus for finding the resistance of wire. The construction is very simple and the materials required few and inexpensive.

Select two boards 17¾ in. long by 6¾ in. wide by ⅝ in. thick; dress and sandpaper one side of the best of the two boards. These are for the top and bottom, and must be nice and smooth.

Select four pieces 9½ in. long, ⅝ in. thick and 1½ in. wide; these pieces are for the standards that hold the top and bottom boards together. They must be set or screwed to the top and bottom boards, as indicated in Fig. 1.

A, B, C and D are the four pieces for the uprights; these must be set perpendicular to the bottom board and must fit the top the same as the bottom. These pieces had best be put on with screws, so they will fit tightly. In Fig. 2 is shown their dimensions. These pieces must be placed so as



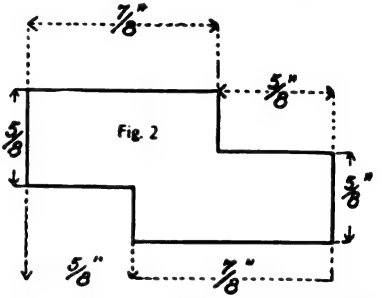
to leave a margin of ¼ in. on the sides and no margin on the ends, as per Fig. 1. When this is done we have a frame which has neither sides nor ends excepting the four uprights.

We can now wind our coils for the heater. Cut 28 pieces 16 ft. long from a coil of broom wire; this wire is used in broom factories, and it is also used by tinners. It can be bought for 8 or 10 cents a pound, and 2½ lbs. will be enough. The gauge is No. 19 B and S.

Wind each one of these 16-ft. wires upon a ½-in. iron rod; be sure and wind it close and tight, so that when you take it off the rod it will present a closed spring.

After they are all wound (14 to each set), they must be joined together, as in Fig. 3. Fourteen of these coils must be made as if they were one coil, as per sketch, and 14 to make the other coil. We will then have two coils in the heater, and either or both of them can be turned on or off at once.

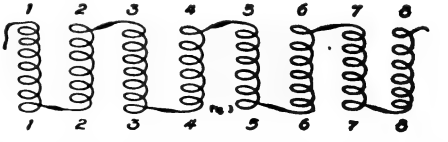
These coils must now be put in the frame so that they will not touch any of the coils in either set. They can be fastened to the top and bottom boards with double-pointed tacks. Care should be taken about driving



the tacks in far enough, because if they are not they will break loose and make the sides of the coil springs touch each other. The free ends of each set of coils will be used for connecting up to the circuit, so that they will not be cut off.

Cut two pieces of sheet iron 15⅞ in. long, 9½ in. wide; also two pieces 5⅝ in. long by 9½ in. wide for the ends. These pieces should be perforated with a ½-in. punch. The maker can select some pretty design, so that the punchings will not look rough when done.

Fig. 4 is a home-made fuse block, ½ in. x 2⅞ in. x 6 in. Binding posts, 1 and 1', are 1 in. high and are larger than the other ones. The current comes in at 1 and 1' and passes by wires to 2 and 2', thence by fuse wire to 4 and 4', and then by wire to 3 and



3'. The only binding posts that we will use for the stove will be 4 and 4', 3 and 3', and for the current intake 1 and 1'.

This block is made of poplar or any other kind of lumber, as it is thoroughly protected by the mica. It can be placed about 1½ in. from one end of the heater and fastened there. After being fastened bore four small holes exactly beneath posts 4 and 4' and 3

and 3' and then make connections, as in Fig. 5.

The switches can be placed on the top of the heater, opposite the fuse block, and in

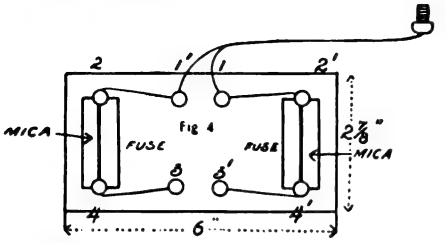


Fig. 4

the middle can be fastened a convenient handle. The top view will be like Fig. 6 when completed.

Before the sheet-iron pieces are put in, the four standards should have some small strips put in between them at both top and bottom, so that the strips will not fall through, and also 16 holes should be bored in the bottom board in the center with a ¾-in. bit. The bottom boards should have a small leg, diameter, ½ in. x 1 in. long,

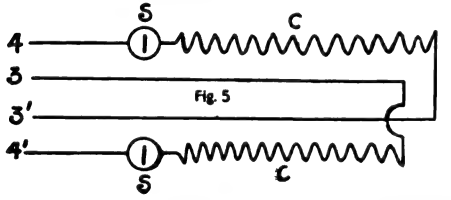


Fig. 5

so the cold air can circulate to the heating apartment. Then place the sheet-iron strips in and fasten them with little strips.

The coils are made for 104 volts, but if the wood gets too hot, paint it with fireproof paint and it will be all right for 110 volts. The cost of such a machine should not exceed 75 cents.

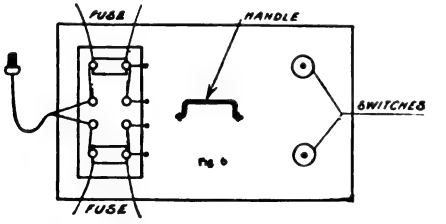


Fig. 6

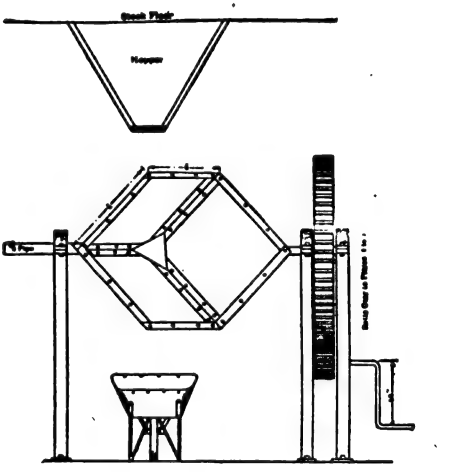
The sheet-iron pieces should be made with as many holes in them as possible.

When through using a square wipe all perspiration marks from it, and occasionally put on a few drops of oil. Never use emery or sandpaper on nickel or black finished squares.

HOW TO BUILD A CONCRETE-MIXER.

To build the concrete-mixer shown in the illustration line a cubical wooden box with No. 10 sheet steel and arrange an iron manhole at one corner. Mount the box on two corners or trunnions, one of which is a piece of 3-inch pipe, through which water is introduced and the other of which is connected to a hand-crank by means of a gear-wheel and pinion.

Turn the manhole up to receive the charge from the hopper and then fasten it down. Revolve the box a few times to dry mix the ingredients, then introduce the proper quantity of water by hose and nozzle through the hollow trunnion, and revolve the box as long as necessary.


Home-Made Concrete Mixer

To discharge the contents into a wheelbarrow to be transported to the work, remove the manhole and rotate the box part way. Do not have the mixer placed so far away that a long trip on the wheelbarrow is necessitated, or the liquid will separate from the material and, if the wheelbarrow leaks, will run out and reworking the concrete will be necessary.

This apparatus was highly recommended by Henry W. Edwards of Grand Junction, Colo., in a paper read before the Atlantic City meeting of the American Institute of Mining Engineers.

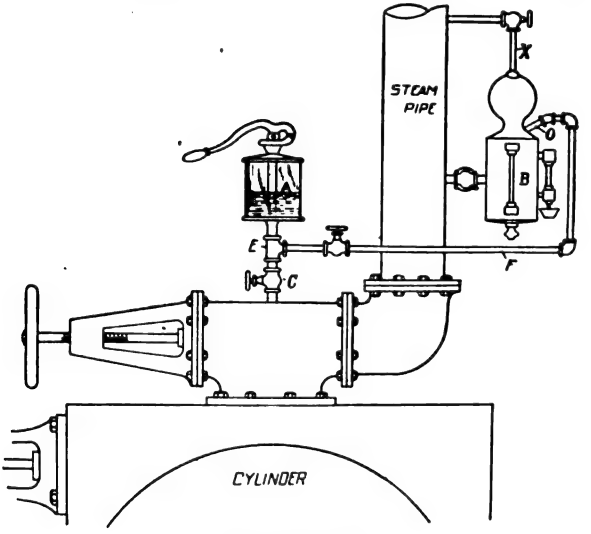
The following paste is good for keeping wood light: One-fourth pound beeswax scraped into one-half pint of turpentine. If it is wished to darken the wood add linseed oil.

A KINK FOR THE LUBRICATOR

The following kink may be old to some, but those having never tried it may use it with benefit.

Between the pump cup, A, and the throttle or steam-chest insert the valve C, and the tee E. In the ¼-in. pipe, F, insert valve, D. Pipe, F, taps the "fill-up" of lubricator B at O. Close valve C, open D and pump oil from A into lubricator. The condensed water is displaced by the incoming oil and rises through pipe X and is carried off into the steam pipe. Thus the draining of the lubricator is avoided.

In case of the failure of the lubricator and it is desired to oil cylinder by hand, close valve D, open C and pump oil direct to cylinder.—Contributed by Lee Boyer, Okmulgee, I. T.



Lubricator Kink

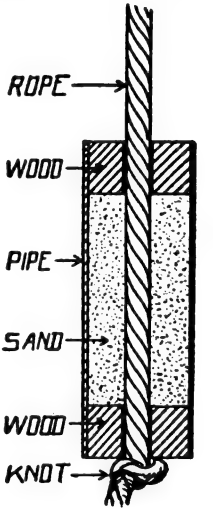
SIMPLE WAY TO FASTEN A ROPE TO A RING

Make an ample-sized loop by braiding the end of the rope into the rope. This may be done by passing the end of the rope, which should be untwisted, under every second strand, cutting a little out each time to make it taper. Then roll it on the floor with the foot and a neat job will result.

To attach to the ring simply pass the loop through the ring and slip the loose end of the rope through the loop. This gives two thicknesses of rope on the ring, is easy to put on and remove and as there is no knot, there is no loose end of rope to bother with.—Contributed by Paul McMichael, Hartstown, Pa.

COUNTERWEIGHT FOR DROP OR SLIDING DOORS

A cheap and good counterweight for drop or sliding doors or for tightener pulleys, may be made of a piece of 3-in., 4-in. or 5-in. gas pipe of any convenient length. Put a common cast-iron washer at one end, or a block of wood will do. Bore a hole through the wood and pass a rope through. Tie a knot in the end of the rope and put a block of wood corresponding to the first block at the other end of the pipe to hold the rope in the center of the pipe. If the weight is not heavy enough, fill the pipe with anything convenient, sand will do.—Contributed by F. A. Sustins, Stevens Point, Wis.



Counterweight

It is stated that an alloy consisting of 90 per cent copper, 6 per cent tin, and 4 per cent phosphor tin—containing 5 per cent phosphorus—has been found the best for castings for hydraulic purposes. The addition of two parts of lead makes the metal cut easier, but the castings are sounder and more uniform without it.

All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

CHINESE METHOD OF MAKING OIL SKINS OR SLICKERS

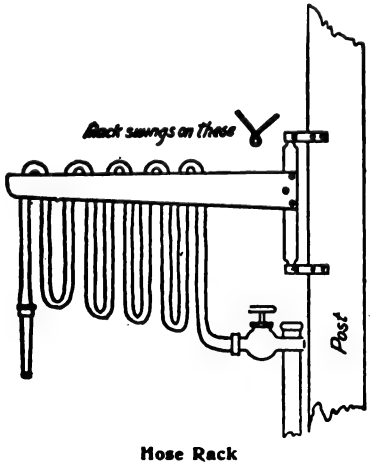
What is called oil skins and souwesters is called slickers in civil life, and have a disagreeable habit of sticking together when put away in dry, warm weather, which spoils them and makes them less waterproof.

The following simple formula makes them waterproof and when thoroughly dry, you can roll them up and put weights on them and they will come apart without sticking:

To one quart of pure raw linseed oil add two fresh eggs, well beaten, and mix. Apply with a rag or brush, let dry and give a second coat.—Contributed by John Rhodes of the U. S. S. Denver.

SWINGING RACK FOR HOSE

A hose rack that will swing in any direction the hose is pulled and may be placed near the ceiling and out of the way, provided the nozzle hangs within easy reach, is

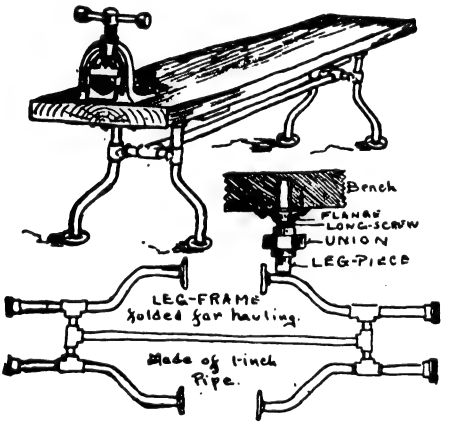


Hose Rack

shown in the illustration. This rack can be made by anyone, declares the Woodworker, and at trifling cost. It consists of a swinging double bracket 3 ft. long and with the sides far enough apart to allow the hose to pass freely between. It is provided with arms of 7x¾-in. half-round sticks, smooth on top, over which the hose is looped. When the hose is wanted, merely grasp the nozzle and walk away and it will come off readily.

PORTABLE WORK BENCH FOR PLUMBERS

The portable work bench shown in the illustration is described by a correspondent of the Metal Worker as being especially

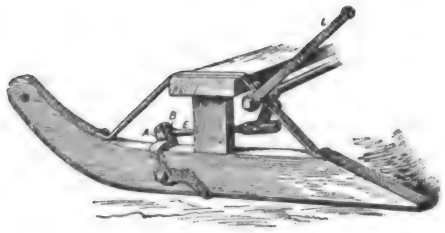


Plumbers' Portable Work Bench

convenient for plumbers. The top of the bench is made of 2½-in. poplar, 15 in. wide and 6½ ft. long. Four long screw nipples, with the collar half of four unions on the short threads, are screwed up into holes bored, as shown, through floor flanges which are screwed to the under side of the top. To set up the bench the standards are twisted upright and the top placed and the collars of the unions screwed down with the hand. No braces of any type are necessary in general work up to 1¼-in. pipe. For benches to be used regularly on 1½ and 2-in. pipe some form of brace easily applied and leaving the bench still of the quick knockdown type would be an improvement. For starting occasional threads on large pipe the thrust strain can be taken care of with a piece of plank in the frame.

HOW TO MAKE A SLED BRAKE

A sled brake like that shown in the sketch was used by a correspondent of the Blacksmith and Wheelwright to hold loads of 12,000 lb. in the mountains. To make it, proceed as follows:



Sled Brake Attached

Make a roller, R, the same as a double cam roller for a wagon brake, only heavier, 1½-in. round iron. Leave the end square for lever L to be held on with key. Make rods same as for a wagon brake, only make eye to connect with dogs A and B. To make the dogs take a piece of iron ⅝x3 in. and the length must depend on the width of the runner, but make the dog B on the inside of the runner about 12 in. long. Make a square turn at the middle. Draw the end down 3 in. from that turn and let it come at 45 degrees. Split the end and weld in a piece of steel. Sharpen so that it will be 1½ or 2 in. wide where it comes to the bottom of the shoe. The other dog, A, is made the same way, only it is long enough to turn over the runner at the top and meet the eye bar, E. They are connected to the runner with a ⅝ bolt, which must be put in so the snow will turn the nut on instead of off.

CAT HELPS ELECTRICIAN

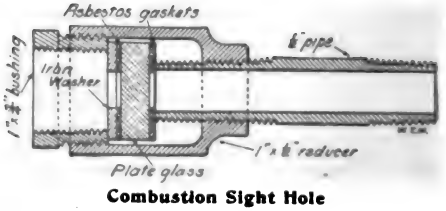
Last spring, when wiring a house for electric gas lighting, I had occasion to run a wire between a chamber floor and the ceiling to light the chandeliers in the rooms below. The gas fitters had taken up flooring in two places about 15 ft. apart, a greater distance than I could work the wire through. An interested spectator was a big yellow tom-cat, "Foxie" by name, and I concluded to impress him into the service, so I tied a chalk line around his body and pointed his nose down into the hole with directions to "scat," and he "scatted," being attracted by the light at the distant opening, where he brought the line out all right. I have since repeated the performance, and it will work every time, provided you can find the helper. If the cat is inclined to waste time under the floor, blow a little tobacco smoke into the opening where he started and he will hasten.—Contributed by Andrew Whiton, Hartford, Conn.

COMBUSTION SIGHT HOLE FOR TESTING A GAS ENGINE

A valuable device for testing engines is called a combustion sight hole and is adapted for use with make-and-break igniters. The Gas Engine tells how to make this device.

Screw a pipe nipple, ½-in. iron pipe size with a long thread on one end, into the cylinder head. On the thread of the nipple screw a 1x1½-in. reducer into the outer end of which screw a 1x¾-in. bushing, to be used as a stuffing box nut in holding a piece of thick plate glass in position at the end of a ½-in. nipple. Use asbestos gaskets to separate the glass from the nipple and the iron stuffing box washer. The distance of the glass from the inner side of the cylinder head should be several inches to prevent its becoming overheated and breaking, and its diameter should be so small that it does not touch the inside of the reducer.

This apparatus enables one to view the



Combustion Sight Hole

interior of a gas engine while the engine is in motion. For safety, do not put the eyes too close to the glass, but stand several feet away, though it is hardly probable that the glass will break. The cost of the device is under a dollar.

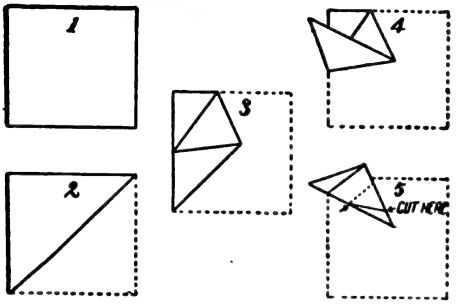
MIXING CEMENT

To make a cement block as hard as a rock and with no limit as to its lasting qualities, writes J. H. Johnston of Albion, Ind., proceed as follows:

Mix the cement in the usual manner and leave stand 12 hours; then break it up and mix again. Let stand for another 12 hours and remix and use.

TO CUT A FIVE-POINTED STAR

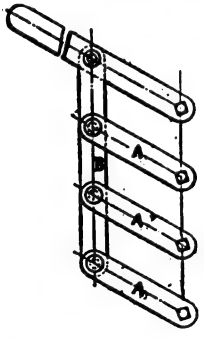
The accompanying diagrams show how a square of paper can be folded so that a five-pointed star can be cut with one clip. The



kink is old, but oftentimes useful.—Contributed by J. B. Dean, Reading, Mich.

LEVERS FOR TIGHTENING GIB-SCREWS ON MILLER KNEE

For tightening at once all the gib-screws locking the milling machine knee to the column the arangement of levers shown in the illustration works like a charm, says a correspondent of the American Machinist. The short levers, A, are all of the same length, have the same distance between holes and the position of the square holes with relation to the center line of lever is the same. Holes B are spaced to correspond with the spacing of the gib-screws.



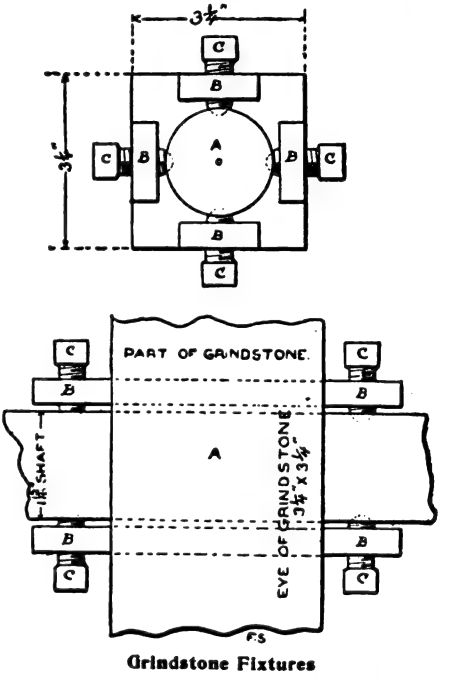
The gib-screws were all ground off at the ends when necessary, before assembling, so that when they were tight each would allow its lever, A, to stand at the angle shown. A movement downward from the position shown, and through an angle of about 60 degrees, is sufficient to loosen the knee.

There are two kinds of sizes, oil and water. Oil size makes an adhesive surface upon which the gold leaf must be laid immediately. Water size dries hard and when the gold is to be laid must first be brushed over with water. Oil sizes are used in decorating furniture. Water sizes are used for burnished gilding. Oil sizes do not harden sufficiently for this purpose.

GRINDSTONE FIXTURES

A set of grindstone fixtures like those shown in the illustration were made by a correspondent of the American Miller ten years ago and used for hanging a 600-lb. stone. The stone hangs as true today as when first hung.

The shaft, A, is a piece of $1\frac{1}{8}$ about 3 ft. long and the hangers are four pieces of tire



Grindstone Fixtures

iron, 1½x1½, 7 ft. long, drilled and tapped ¾ in. from the end for set screws, which were made oval point to fit the countersink in the shaft. The eye of the stone was laid out and made 3¼ in. square with a cold chisel and the stone was then hung and turned up perfectly with set screws.

REGLUING BRIDGE OF A GUITAR

Having occasion some time ago to reglue the bridge of a fine guitar and not having suitable clamps, I removed the pegs from the guitar and replaced them with six binding screws, taken from the carbons of discarded dry batteries and left the instrument alone till the glue had had time to dry. This also allowed of immediate use of the guitar when necessary.—Contributed by Wallace S. Allen, Denver, Colo.

PATTERN SHOP CONVENIENCES

For transferring lines to irregular surfaces the vertical plumb or box square will be found convenient. This device is shown at Fig. 1 and is made of wood. The marker shown at the upper part of Fig. 1 and in dotted lines at the right-hand side consists of a straight piece of hardwood with a brad driven in the end and filed to a point, as at A, or a metal plate let in flush with the face of the marker and filed to a point. The point should be in exact line with the face, B, says a correspondent of the American Machinist. Figure 2 shows how the device is used for drawing a line across a core box. It is also convenient for pipe connections, stove work, etc.

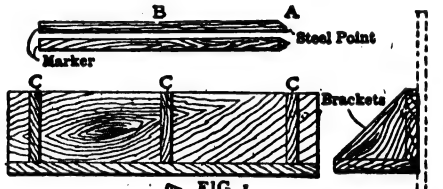


FIG. 1

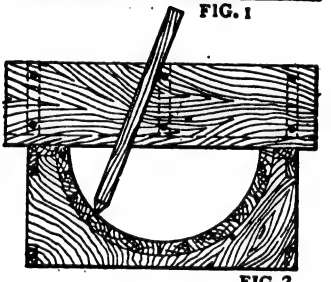


FIG. 2

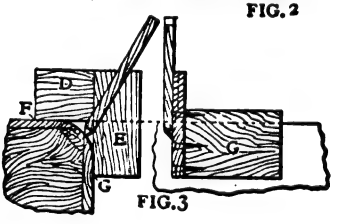


FIG. 3

Another form of the device is shown at Fig. 3. The brackets on the device as shown at Fig. 1 exclude it from this class of work, but Fig. 3 receives its stiffening from the faces D and E. These are halved together and attached to face F and G as shown.

A method of converting a rabbet plane into a core-box plane is shown at Fig. 4. Wing H, which should be twice as wide as the body of the plane, is attached to the body by screws at a right angle to it, the face of the wing projecting slightly beyond the sole of the plane at I, so that it comes opposite the cutting edge of the bit. The wing is gouged out opposite the throat J of the plane to allow the shavings to clear themselves.

A pair of calipers for large work is shown at Fig. 5. They have a light wooden frame made of strips screwed together and are furnished with adjustable pins, K, made from ordinary dowel-pin stock.

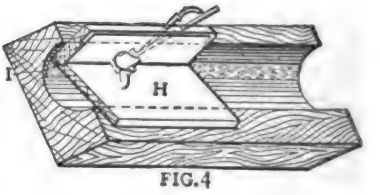


FIG. 4

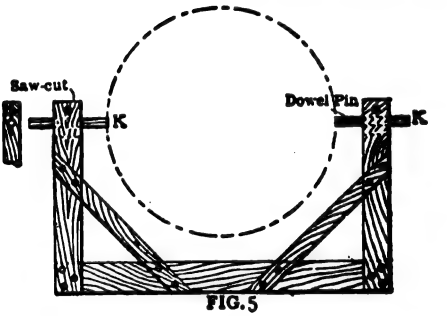


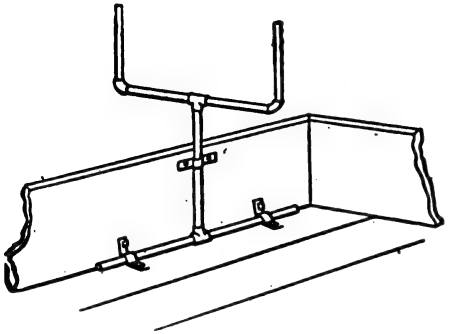
FIG. 5

TO CARRY LONG PIPE ON A DELIVERY WAGON

The job of carrying pieces of pipe 16 and 20 ft. long on a 10-ft. delivery wagon is one that often confronts the plumber or steamfitter. To make the pipe less unwieldy to transport a device like the one illustrated is recommended by a correspondent of the Metal Worker. It consists of a forked support to hold the pipe so that it can extend out over the horses' backs instead of trailing out at the rear.

A support is placed at the front and another at the rear of the wagon, the front one being a trifle higher than the other. Each is supported by a standard which is prevented from revolving by a piece of pipe extending lengthwise in the corner of the wagon. Three straps or pipe hangers,

carefully bolted to the wagon box, fasten the upright in place, in each case. If the supports are fastened to the stanadrds by a



Device for Carrying Long Pipe on Delivery Cart

union, they will be detachable in case bulky supplies are to be carried.

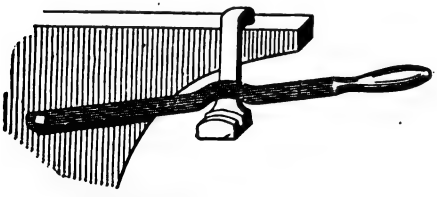
WAX VARNISH FOR MARBLE

Marble or statues exposed to the air may be preserved by applying a varnish made of 2 parts of wax in 8 parts of pure essence of turpentine. Apply the varnish hot, a thin, even coat, so that the lines of the figures will not be destroyed.

HOW TO MAKE RINGS AND PULLEY BLOCKS

Rings and pulley blocks were once called thimbles, and only a few smiths knew how to make them. The process is described by a correspondent of the Blacksmith and Wheelwright.

"Drill a ½-in. hole in your anvil and cut a thread in it for a set screw. Then make a hand lever and fasten it to the anvil with the set screw. Make a piece to fit in the



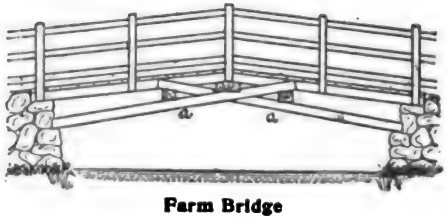
Making Rings and Pulley Blocks

anvil hole one inch square, and let it project over the anvil toward you. Fuller the end of it like a bottom swage. Make a loop the size you wish, get it hot, put it in the piece that is in the anvil, and bring your lever down on to it. Keep turning the hoop as it rounds it up, and you have a complete thimble in less time than it takes to tell you about it.

"For making open thimbles, we used to hammer our iron to a feather edge on both sides. We had a hardy made so that it would cut the ends the right shape. Then we put in a bottom swage and hollowed the thimble with the pein of the hammer. Then, holding it with a pair of narrow-bitted tongs, we turned the thimble over the anvil horn with the pein of the hammer."

BRIDGE FOR FARM USE

On a farm crossed by small streams which it is necessary to bridge, the form of bridge shown in the illustration will be found adaptable to almost any condition; and when it is built of good timber, says the Epitomist, forms a lasting and serviceable



Farm Bridge

structure. This bridge is especially valuable where a single log cannot be used as a stringer. Good timber of a size sufficient to sustain the weight the bridge must bear should be used for the stringers, a.

HOW TO SQUARE WINDOW SHADES

Window shades that are imperfectly squared will not roll up straight, and this is almost certainly the result where a square, of wood or metal, is used for the purpose.

The proper way to square a shade, directs Hartshorn's Roller, is to cut the cloth off the roll the right length, allowing for the bottom hem and for several turns around the roller when the shade is pulled all the way down. Then fold over the cloth, and bring the two outer edges together (Fig. 1). If the finished shade is to be narrower than the cloth, measure off one-half the width, top and bottom, using a rule, and put an awl through both thicknesses of cloth as close to the top and bottom as possible. If necessary make a slight short crease at the top and bottom of the shade. It is a good

plan to use two awls. Then spread the cloth out flat, carefully place a straight edge on prick marks A and B, Fig. 2, and with an ordinary shoe knife, very sharp, cut out the cloth. Cut also lines C to D, A to C, and B to D. Every corner will be

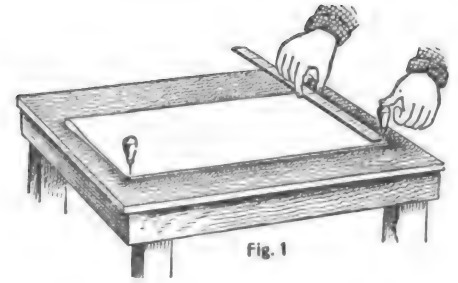


Fig. 1

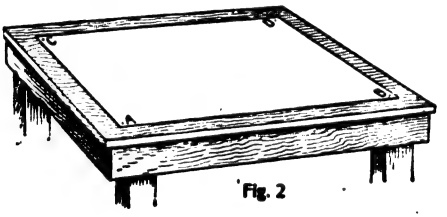


Fig. 2

Fig. 3

a perfect right angle. Fig. 3 shows how the edge of the knife should be ground, round and sharp. If the cloth is the right width for the curtain without cutting, only the top and the bottom need be squared. A number of shades may be cut down at one time.

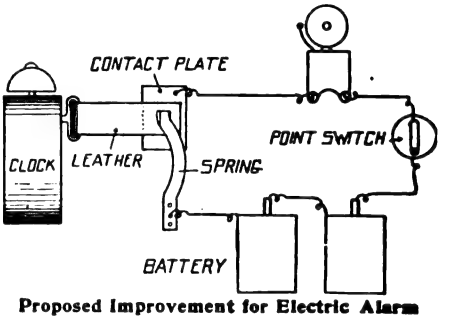
Never use shears for cutting shades, as they cut jagged edges and cause the cloth to ravel.

TO BROWN GUN BARRELS

Mix chloride of antimony to thin creamy consistence with olive oil. Heat the iron slightly, dress evenly upon its surface with the mixture and leave until the degree of browning desired is produced.

IMPROVED ELECTRIC ALARM

An improvement in the electric alarm attachment for an alarm clock described in our July number is suggested by Claude E. Harrison, of Clinton, Iowa, who says the



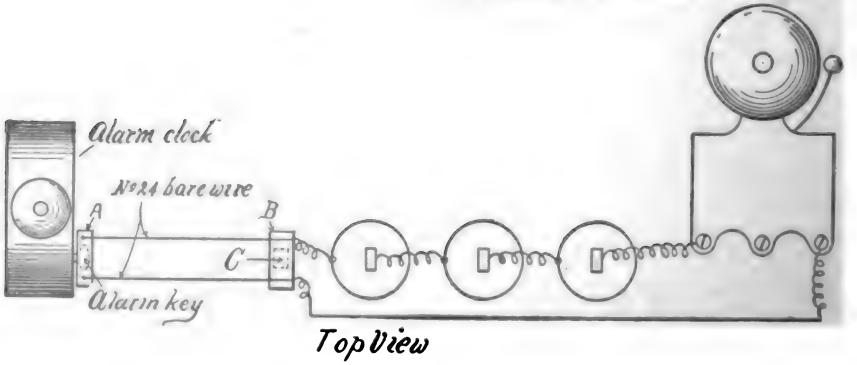
Proposed Improvement for Electric Alarm

No. 24 wires which twist together to close the circuit soon play out.

Instead of the No. 24 wires use a piece of leather ½ in. by 3 in. On one terminal of the circuit place a contact plate made of copper and on the other terminal put a piece of clock spring.

To set the alarm, place the leather between the plate and the spring. When the alarm rings the leather will be twisted from its position, thus closing the circuit and ringing the bell.

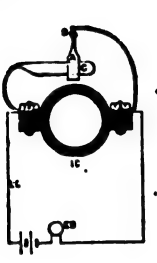
By placing a point switch in series with the circuit, the bell can be stopped without any trouble. During the day the clock can be used in any place desired.



Old Method, Using Wires

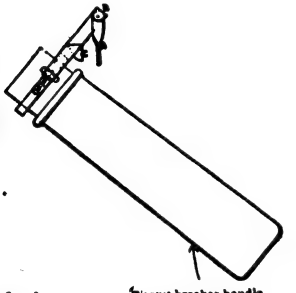
CIRCUIT-BREAKER ALARM

This is an English idea and can be constructed by any electrician at practically no expense. When the breaker opens from a short-circuit or overload the attendant may be engaged elsewhere and not hear the report. The plan was sent the London Electrical Review by R. N. Tweedy, who says:



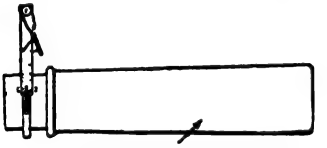
c, Insulating clamp; l. c, Local circuit; g, n, Electric bell.

FIG. 1.



Circuit breaker handle, closed position.

FIG. 2.



Circuit breaker handle, open position.

FIG. 3.

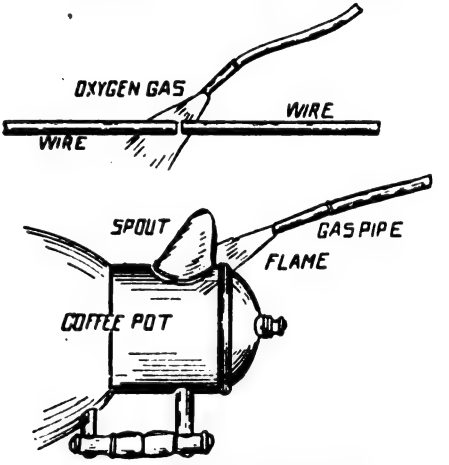
"It is hardly an exaggeration to say that no tools are required to manufacture the device. Certainly it can be made and fixed by the aid of a knife, a pair of pliers and a screw driver, and the cost per breaker is minute, especially if the switchboard attendants do the work, as they well may, while on duty. There can be no uncertainty about the action of the contact maker, for it depends on gravity alone; and the contact faces are always vertical, so that dust cannot cling sufficiently to insulate A from C when the breaker opens. As the current passing through the local circuit is infinitesimal, the pivoted joint, B, which is the only moving part, can be made so loose as to preclude the possibility of sticking, but to provide a still higher factor of certainty the contact maker, A, may be weighted.

It will be seen that the circuit-breaker must be kept in the closed position even when the feeder or generator is out of service, unless a switch is inserted in the local circuit of each breaker; but there is no practical objection to that, as there is always a switch in series with the breaker, and, so long as that is open, the feeder or generator will remain isolated. The interposition of a tumbler-switch to cut any breaker off the alarm bus-bars is to be deprecated, inasmuch as there is always a possibility of the attendant forgetting to close it when putting the circuit-breaker into service."

SOLDERING ALUMINUM

A reader who was at one time employed with a reduction company manufacturing aluminum wire, describes the soldering process used by the company.

The two ends of the wire were first heated by oxygen gas and then pressed together, as shown in Fig. 1. When cooled the wire would be smooth at the joint and appear as one piece. The same process was used in soldering the spouts on tea and coffee pots (Fig. 2)



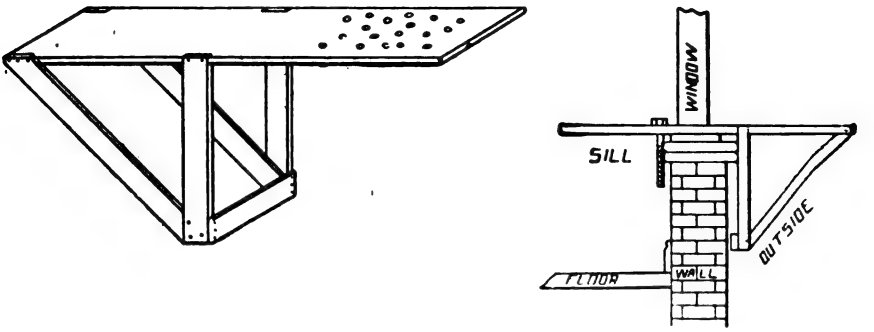
Method of Soldering Aluminum

TO CLEAN SLATE SWITCHBOARDS WHEN BURNED

First clean off with sand-paper; then give one coat of any good filler that will not carry current. When dry, putty up all uneven surfaces, using good, hard drying putty. Rub down with rock pumice stone, clean off and give one or two coats of color, give two coats of japan, varnish, after thoroughly dry, polish in the usual way. A good polish can be made from butter of antimony and raw oil.

Varnished paint may be cleaned by washing with a mixture of a pound of wheat bran boiled in a gallon of water.

HOW TO MAKE A WINDOW JACK



Window Jack for Painters

A window jack for painters' and window washers' use may be made of a plank 5 or 6 ft. long and 12 or 14 in. wide. The part which extends outside has legs or braces to brace against the wall. The inside part has holes drilled through at different intervals, say three rows and about 1 in. apart, to allow for different width sills.

To place, open the window and put the jack on the outside and put a bolt in the hole that comes nearest the sill on the inside. This makes a strong jack and one that a man can work on and feel safe. The bolt used should be about ⅝ in. and need only be slipped into the hole, as the weight on the outside causes the bolt to bear against the sill on the inside and holds the jack secure.—Contributed by Thiede.

HOW TO MAKE A CHEAP DIE AND STOCK

Make the die (Fig. 1) of tool steel 1½ in. wide, ⅝ in. thick and 4 in. long. Drill a ⅝-in. tap hole in the center of the plate, then tap it with a ⅝-20 thread tap. Drill a row of holes and saw them out to make a slot for adjusting the die which is done by means of a stave bolt (A), which passes through both sides of the slot. File three slots to form the cutting edges of the die and back off the starting side of the die by filing. Make three small holes (B B B) in the die for fastening it in the holders or stock.

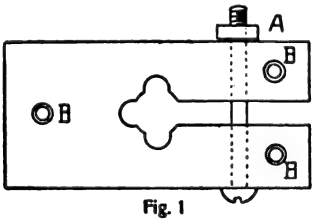


Fig. 1

The stock is shown in Fig. 2. Make it of a piece of tire iron 12 in. long, 1½ in. wide and ¼ in. thick. Put a ¾-in. hole in the center, as indicated, and tap three holes (B B B) for the stove bolts, which hold the

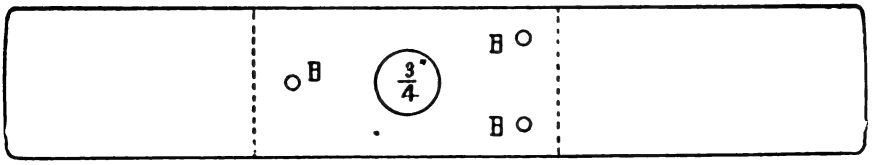


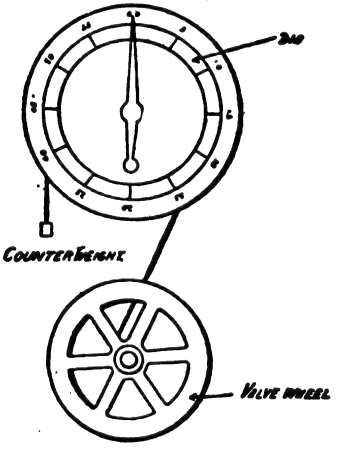
Fig. 2

die to the stock. Harden the die and draw its temper to a straw color and it will cut as clean a thread as one can wish.—Contributed by F. G. Emmelmann, Indianapolis, Ind.

TO FIND THE NUMBER OF TURNS A VALVE IS OPENED

A device for indicating the number of turns a valve is opened was described at the annual meeting of the Western Gas Association in Chicago recently. This device is shown in the sketch.

A cord is attached to the stem of the valve and thence runs over a small drum, around which it is wound several times. A small counterweight is hung on the free end of the cord. The drum communicates with an indicating hand, which registers on a dial



the number of turns that the valve is opened. When the valve is opened the stem turns and winds up the cord, turning the drum and moving the indicating hand.

CEMENT FOR TIGHT PIPE JOINTS

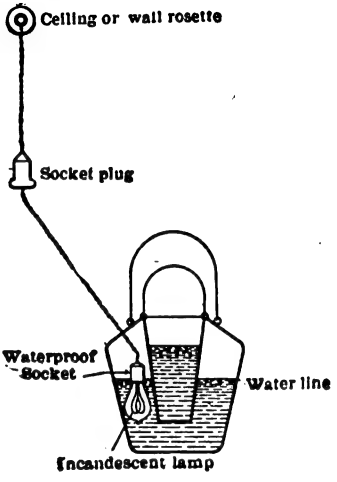
Powder and mix together 15 parts slaked lime, 30 parts graphite and 40 parts barium sulphate. To make a stiffer preparation, omit the lime.

CEMENT FOR WOOD VESSELS

Calcine and reduce to a fine powder, separately, lime-clay and oxide of iron. Mix them thoroughly and place in a closed vessel until ready to use. Before using mix with the necessary quantity of water.

HOW TO MAKE AN ELECTRIC GLUE HEATER

In the shop where electricity is used the electric glue heater is the simplest device of its kind. The illustration shows how it



Electric Glue Heater

is arranged. An incandescent lamp with a waterproof socket is suspended in the water in the kettle, and the joints between the glue pot and the kettle are made perfectly tight. A 32-candlepower lamp will boil the water in from two to four minutes, says a correspondent of Wood Craft, while six or eight candlepower will keep the kettle warm enough for constant use.

WAX FINISH FOR FLOORS

Slice 2 lb. of white wax thin and boil it with 2 oz. of pearlash in 2 qt. of water. Stir until the wax is melted and unites with the water. Apply with a brush and polish with old plush. Good for light service only.

TO SOFTEN OLD WHITEWASH

Wet the whitewash thoroughly with a wash made of 1 lb. of potash, dissolved in 10 qt. of water.

To clean tarnished zinc apply with a rag a mixture of 1 part sulphuric acid with 12 parts of water. Rinse the zinc with clear water.

FUEL ECONOMIZER FOR SAWMILL PLANT

In a small sawmill plant, consisting of a 25-hp. engine and boiler, where it was difficult to keep the steam up to the required pressure, a correspondent of Power fitted up and installed a fuel economizer and water heater that was a great improvement.

The fuel used was green slabs. The boiler was of the firebox type. The exhaust of the

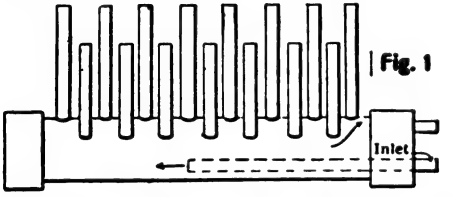


Fig. 1

engine was turned up the smokestack and the heavy draft kept the flues scoured out by means of pieces of bark it drew out through them.

It thus not being necessary to scrape the flues from the firebox end, the heater could be placed directly in front of the flues.

Fig. 1. shows a diagram of the heater. A piece of 6-in. pipe threaded at both ends was covered with two caps. Into this 6-in. pipe a number of ¾-in. pipes plugged at one end were screwed. These water tubes or quills were made short enough to lie below the water line when in position in the smoke-box of the boiler, as shown in Fig. 2. The quills were put in only on the top

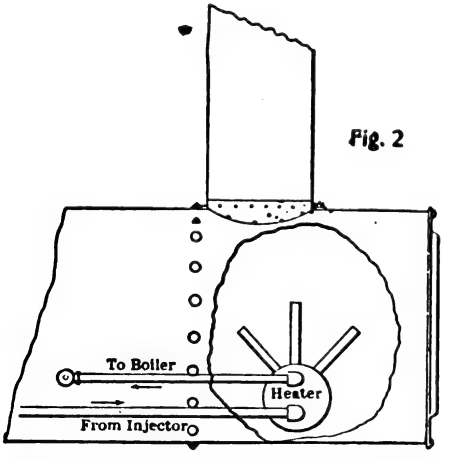


Fig. 2

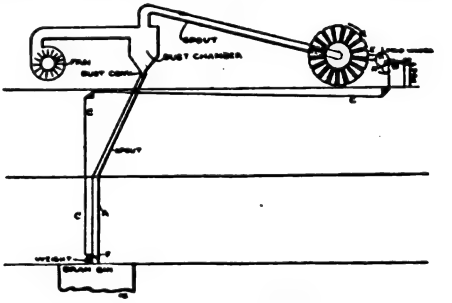
and sides, as shown, so that any sediment which might be in the water would not lodge in and scale them and cause them to burn out.

The heater absorbs a great deal of heat and the feed water is fed through it as it goes to the boiler. Ample water connections were used between the boiler and heater. The lower connection (delivery from the pump or injector) extends in about half way to insure circulation (see dotted lines in Fig. 1). The check and stop valve are on the delivery to the heater, but between the heater and the boiler no check valve was used, so that the heater has always a sufficient supply of water.

When after three years continuous service the heater was taken out of the boiler for inspection the quills were not scaled at all.

DUST COLLECTOR KINK

In a mill where the fan from the scourers blows into the dust chamber spout from chamber to bran bin, a great deal of dust was raised because there was so little stock


Kink for Dust Collector

running down the spout and so much air that it blew up through all other spouts leading to the bran bin. A correspondent of the American Miller tells how he remedied matters, as shown in the accompanying diagram.

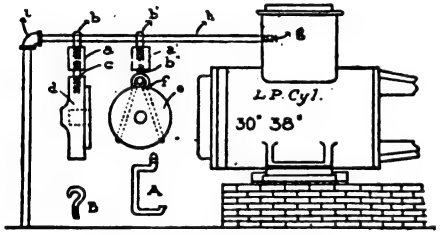
F is a valve in the spout, closed by means of a weight on the lever from F; C is a wire running to trip lever B; H is a small pin in trip wheel to raise lever B; E is a pin attached to the dust collector, which makes one revolution every five minutes. Four pins in the trip wheel, A, cause it to trip every 20 minutes, when valve F closes immediately, shuting off all air. Lever B is bolted loosely to the post or the wall and is just long enough to rise high enough to allow pin H to pass and lever B to drop back in place. It is checked from dropping too low by a small block fastened to the post and just below the lever.

The intervals between the action of the valve can be varied in duration by adding more pins to trip wheel A, or by using fewer pins.

INEXPENSIVE RIG FOR REMOVING CYLINDER HEAD AND PISTON

A simple and inexpensive rig for removing cylinder heads and pistons is shown in the sketch and may be made as follows:

At g there is a 1½-in. pipe plug put in the steam chest to allow for the removal of the L. P. valve stem for repairs. Remove this plug and into the hole screw a piece of 1½-in. extra heavy pipe about 4 ft. long.



To Remove Cylinder Heads

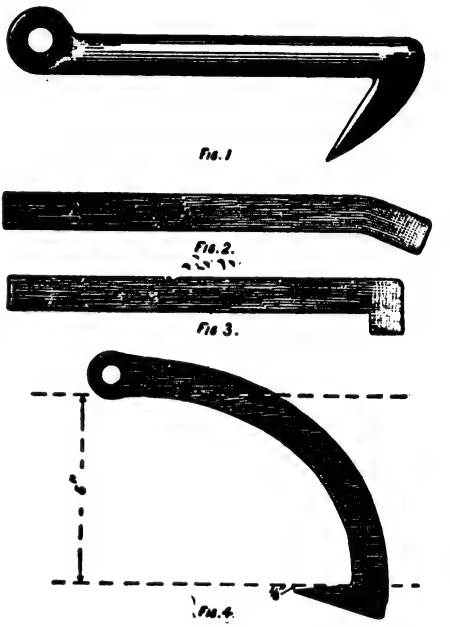
Put an ell on at i and screw a piece of common black pipe long enough to reach to the floor into the ell. Cut two pieces a and a′ each 4 in. long from a piece of 1½-in. shafting and drill a hole for a ⅞-in. standard machine thread through the center of each piece. Tap each of these pieces half way through with a left-hand thread tap and through the other half with a right-hand thread tap. Make the threaded hook, B, of ⅞-in. round iron, bent to fit the outside diameter of the pipe. Cut the hook with left-hand dies. Make hooks b, b′, b″ in the same way, except to thread b″ right hand. Make the bracket, f, supporting the piston head, e, of ⅞-in. round iron. A side view of the bracket is shown at A. Make the stud at c with a right-hand thread on either end; the blank space at c is for the grip of a pipe wrench. This device is recommended by a correspondent of the National Engineer.

HOW TO MEASURE CORN IN CRIB

This rule will apply to a crib of any kind. Two cubic feet of sound, dry corn in the ear will make a bushel shelled, says Grain Man's Guide. To get the quantity of shelled corn in a crib in the ear, measure the length, breadth and height of the crib, inside of the rail; multiply the length by the breadth and the product by the height; then divide the product by two, and you have the number of bushels in the crib.

FORGING GRAB HOOKS OR TWITCHING DOGS

In Fig. 1 is shown a grab hook made of a 1-in. bar of round iron. To make such a hook upset a lump 2 in. from the end of the bar, draw toward a point and bend square across the swell. Leave the front thick, but thin the outside of the point at the back. Cut off 10 in. inside the hook and punch a hole for the chain. This hook will not draw

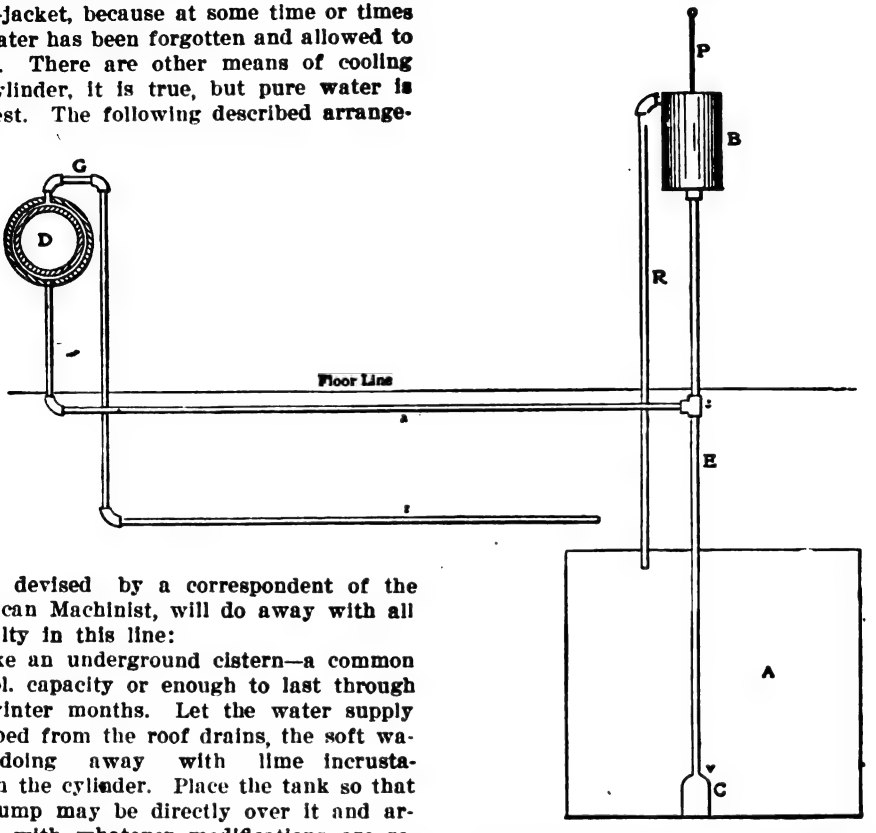


out on a straight draft, says a correspondent of the Blacksmith and Wheelwright, but will come out easily by swinging away from the log and back.

The other illustrations show how a peevey dog is made. Use ½x⅞x11-in. iron, heat it about 1¼ in. from the end to a good warm heat, but be careful not to burn. Bend slightly over the horn of the anvil, Fig. 2, then stand it on its hot end and hammer to the shape of Fig. 3. Draw to a point and in the other end punch the eye. Bend to the shape of Fig. 4, so the point will set ⅛ in. out from one of two parallel lines 5 in. apart when placed as shown in sketch. Use an anvil with a 5-in. face and in either of the dogs described do not allow a square corner to form in the throat, or the heads will break off.

NON-FREEZABLE COOLING WATER ARRANGEMENT FOR GASOLINE ENGINES

The water-cooled gasoline engine in use in a cold climate usually has a cracked water-jacket, because at some time or times the water has been forgotten and allowed to freeze. There are other means of cooling the cylinder, it is true, but pure water is the best. The following described arrangement, devised by a correspondent of the American Machinist, will do away with all difficulty in this line:



Cooling-Water Arrangement for Gasoline Engine

Make an underground cistern—a common 30 bbl. capacity or enough to last through the winter months. Let the water supply be piped from the roof drains, the soft water doing away with lime incrustation in the cylinder. Place the tank so that the pump may be directly over it and arrange with whatever modifications are required, as shown in the diagram. Place a common deep-well pump cylinder, C, at the bottom of the tank A, and carry a pipe up into the bottom of a reservoir, B, which should be placed about 2 ft. above the level of the top of the engine cylinder. Any kind of vessel that will hold 3 gallons or more will do for the reservoir. Run the pump rod, P, up through pipe E, and reservoir B, and attach it to any convenient mechanism for giving it the necessary reciprocating motion. At a point e in pipe E, preferably below the floor, insert a T and from it run pipe a to the bottom of the cylinder water-jacket. Carry the overflow taken from the top of the cylinder back to the tank by pipe r. At point v in pipe E drill a $\frac{1}{16}$-in. hole and leave it open at all times, so that when the pump stops the water will drain back.

The pump should in all cases be of ample capacity and should have a stop-cock at G, for gauging the flow, the surplus being returned to the tank by the overflow pipe R attached to B near the top. A cooling water temperature of 150 degrees as it leaves the cylinder indicates the highest degree of heat permissible in running gas or gasoline engines.

INK FOR LABELING

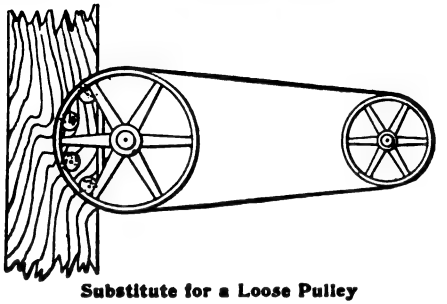
An ink that nothing will bleach is made by mixing pyrogallic acid and sulphate of iron in equal parts. Particularly useful for marking labels on bottles containing acids. Varnish the label after the ink is dry so that moisture will not affect it.

New oak may be made to look old by sponging with a strong hot solution of common soda in water. This will raise the grain which must be cut down with sandpaper

LOOSE PULLEY SUBSTITUTE

For a belt that is not much used the appliance shown in the illustration will take the place of a loose pulley, says a correspondent of the Engineers' Review.

Small rollers are located near the flange



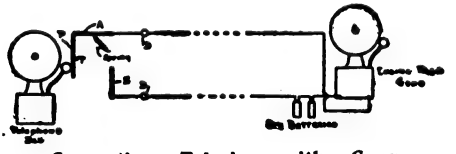
Substitute for a Loose Pulley

of the driving pulley. The top roller is even with the face of the pulley or nearly so, the other three are a little nearer the shaft and the lower one is still nearer the shaft. The belt may be handled by hand with this device, though for a large belt it is better to use a stick for removing it. The rollers may be fastened to a joist by log or wood screws on which they turn. The belt will not wear by friction when standing as in the case of a loose pulley.

GONG CONNECTIONS FOR TELEPHONES

For the noisy plant where the telephone bell cannot always be heard a simple gong signal will prove a great convenience.

Put the telephone in a quiet room adjoining the boiler room and connect it with the gong and two dry batteries in the boiler



Connecting a Telephone with a Gong

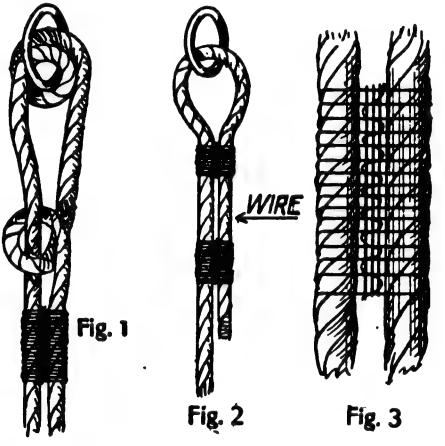
room, as indicated in the illustration. The dry batteries and the gong are connected in series to binding posts, B, B, says the Practical Engineer. T is a trigger pivoted at P, A is a piece of steel pivoted so that the spring can draw it down to touch the contact S. When the telephone bell rings, the clapper releases arm A, which contacts at S completing the circuit and causing the gong in the boiler room to ring. The trip must be reset after every call.

IMPROVED METHOD OF FASTENING A ROPE TO A RING

In regard to the method of fastening a rope to a ring, given in our September number, Harry de Joannis, of Chicago, says:

"The method illustrated in your article does not present, as stated, two thicknesses of rope to wear through, for, when the first thickness is worn through, it is worn through in such a way that the half-hitch holding it is insufficient to stand the strain. Not only this, but the seizing shown in the illustration should have two or three cross tightening strands, as shown in the sketch submitted herewith, to prevent the inevitable play of one rope upon the other.

"By the method I show, the rope takes a round turn through the ring and then is given a half hitch over the main rope and



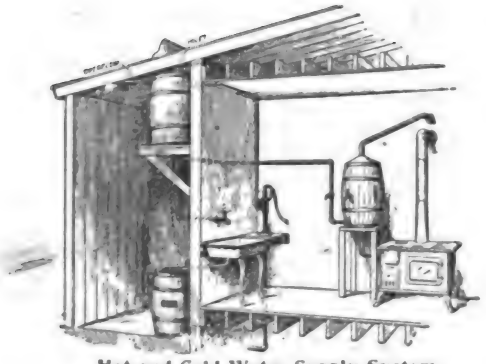
the end is fastened to the rope (Fig. 1), as in your illustration, with the addition of the strands above mentioned. The advantage I claim for this method of fastening is that the half-hitch takes a considerable portion of the strain and the round turn gives two wearing surfaces in the ring which can easily be examined at any time by pushing the half-hitch towards the ring and enlarging the round turn so that the inside surfaces of the rope are seen easily. If wire is used (Fig. 2), it should not be hammered flat nor is a round turn needed in the ring whatever. It should be laid around a split thimble and two seizings should be applied to it instead of one.

"In tightening seizings, the strands are woven in and out and then pulled tight and cut off short (Fig. 3)."

WATER SUPPLY SYSTEM FOR THE KITCHEN

In country towns where there is no water system a simple supply system for the kitchen will be found a great convenience.

Procure three barrels, one a very large



Hot and Cold Water Supply System

pork barrel. Mount the large barrel on a strong bracket outside the kitchen, in a shed if there be one, and make an inlet by which the soft water from the roof will flow into it. With a ½-in. pipe, an elbow and a bib for connections, run the water from this barrel to the kitchen sink and arrange for the overflow from the barrel to be run in another direction. Pipe the discharge from the sink to another barrel placed just below the supply barrel, but on the shed floor. The barrel can be wheeled away on a barrow or cart to empty in some suitable place.

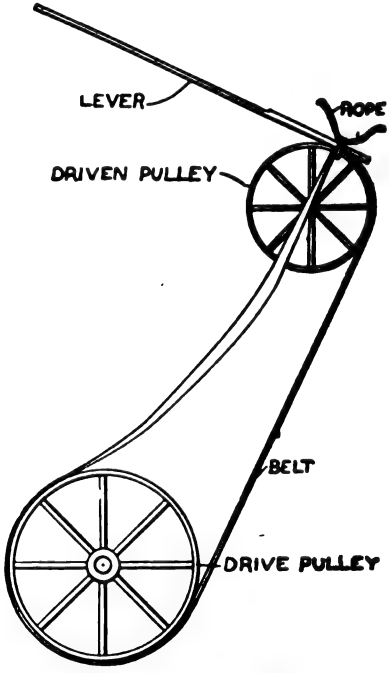
If the pump be one of the ordinary kind and out of doors, replace it with a force pump in the house at the sink and arrange it to connect with the supply barrel so that when there is no soft water the tank may be filled from the pump.

Place the third barrel on a strong bench back of the stove and lead a pipe from the supply tank to the barrel, connecting it at the bottom of the barrel. This pipe should be provided with a stop-cock to shut off the supply when the hot water barrel is full.

Make the water heater of ¼-in. pipe and install it in the stove. From the bottom of the hot water tank run a pipe to the heater. The return pipe from the heater connect into the side of the hot water tank about 10 in. above the bottom of the barrel. Make the connections by means of iron pipe with long threads cut on it and use jam nuts on both sides against asbestos washers soaked in red lead. Put the hot water service cock a few inches above the side connection so that the barrel can never be quite emptied. Make a cover of sheet metal in the form of a cone for the top of the barrel and lead a small pipe from the cone to the chimney to carry off any condensed steam. This system is recommended by a correspondent of the Metal Worker, who installed one that worked admirably.

PUTTING ON BELTS WHEN PLANT IS IDLE

Starting the mill up in order to put on belts is a source of extra expense which may be avoided by the means illustrated herewith. Place the belt on the driver pulley and run it as far as possible, says a correspondent of the American Miller. Then tie a rope around the belt and pulley behind the arm of the pulley. Put a lever in under



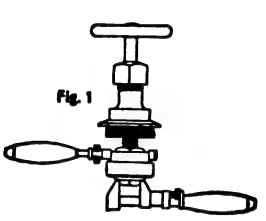
To Attach a Belt when Plant is Idle

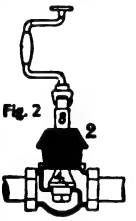
the rope and on top of the belt and press down. With a long lever a greater weight can be exerted on the belt. The driver pulley will then turn the belt on readily.

REPAIRING A DISK VALVE

The following method of repairing a Jenkins disk valve is recommended by a correspondent of the Practical Engineer.

With a large monkey wrench unscrew the bonnet, giving it a quick, sharp pull to loosen the thread. A large wrench will not spring easily and round off the corners of the bonnet. If a valve has been in use





under steam pressure a long while, it may be necessary to apply a Stillson wrench. Remove marks made by the teeth of the wrench by filing carefully. Hold the disk-holder with one wrench and unscrew the nut with another, as shown in Fig. 1. If the disk and nut do not come out together soften the nut by holding it in a gas flame, after which it may be cut or pried out easily and a new one put in. Put a prick punch mark in the edge of the threads to prevent the nut from working off easily.

For repairing the seat of a Jenkins valve Fig. 2 shows a good plan. Remove the bonnet and screw in the bushing (2) to form a guide for the stem (3), on the lower end of which is a circular file (4). When this is turned by means of the brace it files the seat until all irregularities are removed, making it as good as new.

TO SOLDER AGATE WARE

A correspondent in the Metal Worker says holes in agate ware can be soldered, notwithstanding the general belief to the contrary. He says, take a chisel out of your side pocket, as I suppose you carry all your small tools with you, and give the old agate ware a crack or two and see what it does. Then take your file and rasp and give it a few strokes to brighten the metal, after which some cut acid should be put on and the whole can be readily soldered. The owner will say that you have botched his nice agate ware, but this is the best way to do the work.

BLUEPRINT CHEMICALS

For making blueprint paper prepare the following solutions: Citrate of iron and ammonia, 1⅞ oz., dissolved in 8 oz. of water and red prussiate of potash 1¼ oz. dissolved in 8 oz. of water. Keep the solutions in separate bottles until ready to use them. To use, measure equal quantities from each of the bottles and mix by shaking well. Keep the mixture away from white light, warns Machinery, applying it to the paper in a room illuminated with ruby light. Dry the paper in this room, also, and keep it in the dark until used. One ounce of the mixed chemical will cover 4 sq. ft. of paper.

TO FIND NUMBER OF TONS OF HAY

Rule—Multiply the length in yards by the height in yards, and that by the width in yards and divide the product by 15; the quotient will be the number of tons.

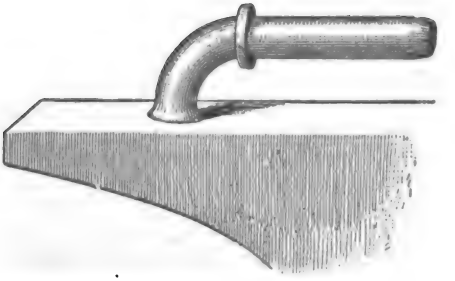
HOW TO TIP BOILER FLUES

Tipping boiler flues is a very simple matter if one just knows how to go about it. A

Tipping Boiler Flues

correspondent of the Blacksmith and Wheelwright recommends the following method:

Lap the flues one-half inch and take one heat and weld in the fire. Then straighten them up on the horn. Second heat in the



Straightening Boiler Flue on the Anvil

fire and weld on the horn. It will be hard to tell where the weld is and the flues will be as good as new.

MAKING FORCED FITS

To bore out a wheel and turn a shaft or other part to be driven or forced into the wheel by means of heavy blows or hydraulic pressure, is an operation of the most frequent occurrence in every machine shop and is of such utility as to be indispensable. The grip and solidity of a driven fit is something remarkable. Bolts and nuts will loosen, but no amount of vibration will affect the integrity of a well-made press fit. Systematic experimenters and mechanical writers have been somewhat neglectful of this subject, and considering its importance, the matter would seem to merit more attention. The data contained in this article came to the author by frequent experience in the every-day work of a machine shop, rather than from deliberate experiment. These conditions do not afford the same opportunity for accurate observation as would a carefully conducted test, but the figures obtained are sufficiently close to give satisfactory results.

The part to be driven must of course be slightly larger than the hole which receives it, but the difference is exceedingly small, and the first step is evidently to determine this amount correctly. The common practice is to gauge the oversize solely by the feel of the calipers, but the element of uncertainty in this method is very large.

In figuring the necessary allowance for any given case, the principal factor is the size of the job. To make a press fit of the greatest possible strength, there should be a difference in size of from two to three-thousandths of an inch for each inch of diameter. The required pressure in tons will be the allowance in thousandths multiplied by the diameter in inches and by one and a half. For example, a wheel is to be forced upon a 5-in. shaft, $5 \times .002 = .010$, which is the required allowance, and the required pressure will be $10 \times 5 \times 1\frac{1}{2} = 75$ (tons). On smaller pieces when the fit is required to be very heavy, the larger figure or .003 per inch of diameter may be used. Say the shaft is 2 in.: $2 \times .003 = 006$; .006 will be the allowance and the pressure will be $6 \times 2 \times 1\frac{1}{2} = 18$ (tons).

It will be apparent, however, upon a little reflection, that with pieces of very large size the necessary pressure would be very great indeed. For instance, a 15-in. crank-pin is to be pressed into its disk. By the rule, $.002 \times 15 = .030$; and $30 \times 15 \times 1\frac{1}{2} = 675$ (tons), the pressure. Very few shops, not even the largest establishments, are equipped with the means of obtaining such enormous pressures; and moreover, it is rarely necessary in large work to fit two parts together with such extreme tightness. An allowance of about .010 on the above pin would be sufficient and would bring the required pressure within more convenient limits.

It is also true that the driving allowance must in many cases be limited by the strain which the job will safely stand. The material and thickness of the metal which surrounds the hole, the length of the forced shaft, etc., these points are in some cases governing considerations. As a general thing, however, in ordinary cases when it is not necessary to go to extremes, the given rule of .002 per inch of diameter may be used on all work up to about 4 in. For larger pieces a total allowance of .008 to .010 is about right, regardless of size. About .007 will make a 40-ton fit on a 4-in. axle. When the required pressure is specified the necessary allowance may be found as follows: Divide the pressure in tons by one and a half times the diameter in inches. The quotient will be the required allowance in thousandths. Thus, a wheel is to be pressed upon a 4-in. shaft at 30 tons: $4 \times 1\frac{1}{2} = 6$ and $30 \div 6 = 5$; .005 is therefore the allowance.

For driving fits, a total allowance of .003 without regard to size is good practice with pieces larger than $1\frac{1}{2}$ in. For smaller pieces apply the first rule given for pressure fits.

A shrink fit is usually made in cases which require the greatest possible binding effect. The allowance may be somewhat greater than for a press fit. Some railway companies shrink their locomotive tires on at 1/64 in. per foot of diameter. Others use double this amount or 1/32 in. per foot. It is probable that about .003 in. per inch of diameter will secure the maximum effect in any case.

In making a press fit with an old wheel which has been previously pressed on and off, the foregoing rules do not apply. In this case the metal forming the circumference of the bore has been surface-hardened by the pressure to which it has been already submitted, and the force required to press the wheel on will be about double that required for new work, or, the forcing allowance may be reduced to one-half regular amount.—Contributed by S. M. Howell, Steubenville, Ohio.

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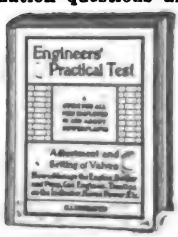

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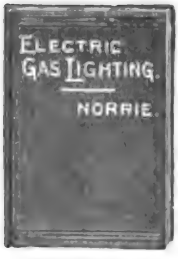

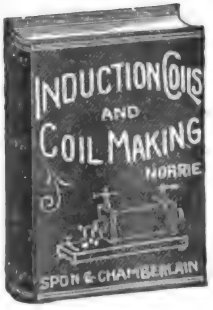

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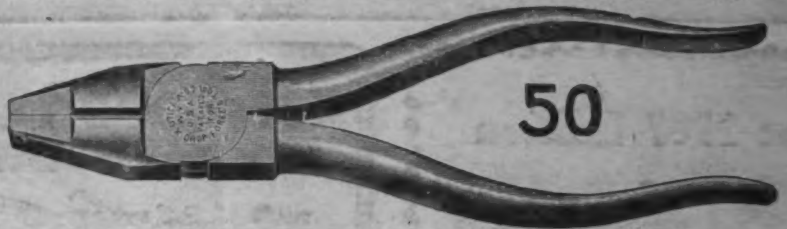

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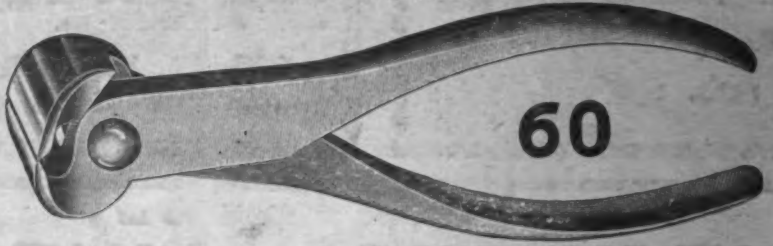

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